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CHINA REPORT

SCIENCE AND TECHNOLOGY

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ZENG XIANLIN ON PROGRESS OF S&T REFORMS

HK120057 Hong Kong ZHONGGUO XINWEN SHE in Chinese 1119 GMT 10 Feb 87

[Report by Qin Lang (4440 2597): "China Scores a Series of Achievements in Reform of the Scientific and Technological Structure"]

[Text] Beijing, 10 Feb (ZHONGGUO XINWEN SHE)--Authoritative sources indicate that reform of the scientific and technological structure in China, which started in 1985, has resulted in a series of changes in scientific research, production and social ideologies.

At a forum held here today, Zeng Xianlin, vice minister of the State Scientific and Technological Commission, reviewed a series of achievements China has made in reform of the scientific and technological structure over the past 2 years.

--Most organs engaged in research of technological development have instituted the technological contract system. Some 390 scientific research organs have become economically independent.

--China continuously has opened up new technological markets and preliminarily formed technological markets. Some 87,000 scientific and technological items were transferred on the markets in 1986, with a transaction volume of 2.06 billion yuan.

--The professional and technological post employment system has been instituted throughout the country, and the old practice of giving priority to those with seniority has been eradicated.

--A large number of civilian-run scientific and technological organs that integrate science, technology with the economy have emerged in all areas. The integration of scientific research departments and factories has progressed rapidly. There were nearly 10,000 organizations combining scientific research with production in China in 1985.

--The "spark plan," which aims at invigorating the local economy, is being carried out step by step. Last year a total of more than 4,000 "spark plan" projects were arranged throughout the country, with an investment

of some 2.2 billion yuan. It is expected that after the completion of the projects, China's direct output value will increase by 10 billion yuan and its profit and tax revenue will increase by 2.5 billion yuan.

The most significant thing, Zeng Xianlin said, is that in this transformation, society has attached more and more importance to scientific and technological work and that intellectuals' social status has gradually risen.

However, some defects still exist in China's current scientific and technological structure. For example, scientific and technological personnel are dispersed irrationally; scientific research units have not yet established a close relationship with enterprises; scientific research departments have been interferred with too much; and scientific and technological personnel were often criticized for their transfers or for doing part-time work. In addition, due attention has failed to be given to civilian-run scientific and technological organs.

/9604
CSO: 4008/2069

NATIONAL DEVELOPMENTS

RAILWAYS MINISTRY PURCHASING COMMUNICATIONS NETWORK FROM FINLAND

[Text] Nokia Telecommunications is delivering a digital telecommunications network to the Chinese Ministry of Railways. The ministry has ordered six digital DX 200 telephone exchanges, digital transmission systems and control systems for the network. Deliveries will take place this year and next. The sale is worth at least 20 million markkas (U.S.$4.4 million). The telecommunications network which Nokia will deliver covers a 400 kilometer-long rail section between Datong and Beijing. The system will at first take care of approximately 5,000 stations. On Thursday [5 February], Nokia announced also two other deals. The Chinese company China Zhihua Cooperation has ordered a digital radio-link network for the Da Yunhen Canal. This order will also include a monitoring system.

Nokia has also received its first order for an optical transmission system. Delivery will take place during the spring, and—according to Nokia—the latter two sales together will be worth somewhat less that 10 million markkas (U.S. $2.2 million). Nokia has also earlier delivered computer equipment to China, including for China's largest oil field.

/12232
CSO: 3650/70

CAAC EYES PARTNERS FOR AIRCRAFT, INFRASTRUCTURE DEVELOPMENT

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 26 Jan 87 p 14

[Article by Joerg Kauffmann, Shanghai: "China Seeks Partners in Aircraft Construction: Cooperation With McDonnell-Douglas; Airbus and Boeing Negotiate; German Consulting"]

[Text] Shanghai, Jan—Flying within the People's Republic of China can become a waiting game; local people we talked to admit freely that one of the reasons punctuality and regularity in domestic air traffic cannot be counted on is the lack of competition. Decentralization is being implemented very slowly; the monopoly held by the Civil Aviation Administration of China (CAAC) is being very carefully chipped away—up to now it has had air traffic firmly in its control, including airport operation and flight safety. Now the state wants to permit the establishment of a number of regional airlines.

Lack of Service

Travelers coming from Frankfurt and landing in Beijing after 17 hours would be well advised to forget strictly Western attitudes at least for awhile. This capital city's airport, the air traffic hub of this gigantic empire, has a lack of service akin to that of a company which is not very oriented toward customer satisfaction but which more or less provides services. Restaurants are only open at certain times, duty-free shops may already be closed at 7:30 in the evening and the connecting flight information on bulletin boards and monitors is often incorrect.

Particularly unlucky travelers have no trouble accumulating domestic flight delays which are three times longer than the flight itself. The reasons for this problem are difficult to determine. Perhaps it is the completely inhomogeneous fleet of aircraft. The CAAC flies pretty much anything that has wings from Russian, American, European and even a few Chinese producers. The fleet includes old planes, as well as the most modern ones such as the Airbus A 310 or the Boeing 737-300. Apparently, it is very difficult for the CAAC to flexibly structure the use of crews and aircraft. Bad weather can mean added confusion because snow plows are not available, for example, or landing aids are not in the best possible technical condition; important airports have

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already been closed down under visibility conditions which at well-equipped large airports around the world would still have permitted landing without problems.

Ten Million Passengers

The opening up of China to the outside world has generated tourism and business traffic. Last year the CAAC handled nearly 10 million passengers, two million more than in 1985. That is not much in a country with over one milliard (billion) people. The CAAC is making an effort to improve conditions at the airports; 20 new accesses have been added to the fleet. The People's Republic could become a fascinating future market for the aviation industry in the West. China, which builds and exports small commercial aircraft, is looking for business partners. Up to now cooperation with the American manufacturer McDonnell-Douglas has made the most progress. In the spring of 1987, the CAAC will place in service the first 150-seat MD-82 which was assembled in Shanghai. The agreement, which was concluded in 1985, calls for the construction of 25 of these well-tried twin-engine jets by 1991.

Naturally, Airbus-Industrie and Boeing have long been negotiating production plants for similar-sized aircraft. China needs a modern 70-seat plane for less frequently traveled stretches. Interested parties from America, Canada, Brazil, France and Sweden are lobbying, but England and the FRG are already further along. British Aerospace and Catic (China National Aero-Technology Import and Export Corporation) have agreed on the construction of short-range aircraft; Messerschmitt-Boelkow-Blohm (MBB), together with the Chinese, is preparing a feasibility study for a type of aircraft with 75 to 90 seats. The decision should be made by the end of 1987.

Germany's interest in China is reflected in the nine-firm joint exhibit which the BDLI (Association of the German Aviation, Aerospace and Equipment Industry) set up in the exhibition hall in Shanghai for the China Aviation '86 exhibition. In addition to MBB, aircraft manufacturers included Dornier GmbH of Munich and Prof Claudius Dornier's Seastar GmbH of Oberpfaffenhofen; Maschinen- und Turbinen-Union (MTU) of Munich exhibited the latest in jet engine technology. German participation in this aviation exhibition was viewed primarily as making an appearance and was hardly in expectation of making concrete business deals. The representative of Anton Piller GmbH in Osterode am Harz was himself therefore surprised when he, as a newcomer, succeeded all at once in concluding an agreement with Catic amounting to DM 80,000 for delivery of frequency conversion systems for supplying power to airports, thus making inroads into the dominant market position of a U.S. supplier. Inge Muehlenberg, owner of an aircraft cabin equipment company in Norderstedt, on the other hand, had a more typical experience. The Chinese were impressed with the quality work of the north German company, which obtains half of its sales as a result of Lufthansa orders, but found the asking price too high.

For years Flughafen Frankfurt/Main AG (FAG) has been an example of persistence in China. Following some success in Asia (Karachi, Bangkok, New Delhi, Macau and the South Pacific), FAG wants to get into the consulting business with the People's Republic of China and at the same time feels it is also opening the

door for German industry. As FAG's "Airconsult" sees it, statements in the seventh five-year plan (up to 1990) confirm its estimation that after birth control China's most pressing future need must be to solve its water, land and air transportation problems. On the table in Beijing is a proposal to develop a transportation consulting company in which the transportation industry of the FRG is involved. It could provide knowhow for the urgently needed modernization of the transportation system and could initiate projects involving highway, railroad and airport construction, the expansion of airport facilities or the laying of pipelines. The FAG plans to be involved in airport planning, training of personnel and management. According to the Chinese, most of the 80 existing airports will be modified to meet the growing traffic requirements and an additional 20 new airports will be built.

The FAG is also negotiating the plans for a new airport in the town of Ningbo, located southeast of Shanghai--in competition with the Japanese who already expanded the airport facilities there. Finally, the talks, together with Lufthansa and German shipowners, have also expanded to include the linking of sea and air transport in the deep-sea harbors. All this requires immense patience, says FAG air freight manager Hans-Juergen Fischer, who has good contacts in China and has long cultivated this virtue of patience. Just like the head of "Airconsult," Karlheinz Rebscher, Fischer also complains about the lack of political support from Bonn. Aeroport de Paris and other European and non-European competitors were always able to count on more effective government backing when soliciting projects abroad.

The negotiations with China are continuing. Negative experiences have not yet caused patience to wear too thin. An initial large-scale offer of cooperation for the development of an air traffic infrastructure, devised by FAG, Lufthansa and Krupp, became bogged down at the beginning of the 1980's.

12552
CSO: 4620/13

EXAMPLES CITED OF MILITARY SHIFTING TO CIVILIAN PRODUCTION

Beijing BEIJING KEJI BAO in Chinese 5 Dec 86 p 1

[Report by Bie Qinghe [0446 3237 3109]: "Military Industrial Technology Transferred to Civilian Use Motivates Economic Development in this City"]

[Text] National defense science and technology units in Beijing have actively arranged the shifting of military technology to civilian use and to Beijing Municipality, which has powerfully promoted the development of technological progress and economic construction for all industries in this city. According to incomplete statistics, over the last year Beijing carried out 396 projects to "shift from military to civilian," the total value of these transactions was 122.53 million yuan. To date, 266 have been accomplished and the others are being carried out.

The shifting of military industrial technology to civilian use has improved the levels of production, product quality, and economic results for civilian enterprises. As for example where Institute No 11 of the Ministry of Electronics subsidized the Beijing Watch Plant No 2 in using military high-frequency laser technology to create a laser drill, where when every second 16 jeweled bearings can be handled, efficiency has been improved from 50 to 100 times that of the original way.

The shifting of military industrial technology to civilian use had also had a stimulating effect on the absorption and assimilation of imported technology, and has hastened the pace of nationalization. The Ministry of Ordnance Industries Institute No 5424 and the Beijing Plastics Plant No 2 jointly transformed the imported "large-scale plastic film five-color printing machine," reaching the complete technical indexes of the foreign sample, which resolved a few difficulties that some imported machines could not.

The shift of military industrial technology to civilian use has also strongly spurred on the development of town and township enterprises. The Academy of Atomic Energy is located in Fangshan County, and they took the initiative in looking into the 7 or 8 town and township enterprises in Fangshan County, and also helped the Fangshan Lamp Plant to improve its product quality and to open up marketing routes; they helped the Yuegezhuang Glass Bottle Plant in substituting soil alkali for soda, which resolved a difficulty they had with a deficiency of raw materials; they transferred a new technology for colored

sand emulsion to the Liang Township Ceramics Plant, which turned around the loss situation for that plant.

What is worth noting is that the working fields for "shifting from the military to the civilian" have begun to expand this year to urban construction and management, as well as to medicine and hygiene. Military industrial technology has not only played an active role in industry, but has also used the comprehensive technologies of military industries to participate in the urban building and management of Beijing.

12586
CSO: 4008/2042

PROGRESS IN 12 MAJOR TECHNOLOGY PROJECTS REPORTED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 30 Nov 86 p 1

[Text] Development of the 12 major technology equipment projects determined by the state is now fully underway, and has even obtained a group of major development achievements.

In July 1983, the State Council made relevant resolutions in which they determined 12 sets of major technical equipment projects, which included: large scale strip mining sets of equipment, large scale thermal electric plant sets of equipment, superhigh-voltage transmission transformer unit equipment, complete sets of equipment for the Daqin line heavy-load railway, complete sets of equipment for the second stage of the Baoshan Iron and Steel Complex, complete sets of equipment for 300,000 ton ethylene production, complete sets of equipment for large-scale compound chemical fertilizer production, complete sets of equipment for coal chemical engineering, civilian aircraft, and the Beijing electron-positron collision machinery.

According to a report in JINGJI RIBAO, the domestic manufacturing task for 2,030 continuous rolling mills that are part of the Baoshan Iron and Steel Complex second stage project may be expected to be finished ahead of schedule this year, and the quality is in accordance with the technical standards for similar products from West Germany. The 520,000 ton urea facility designed and made by this country has been technically approved at the national level. This is a major breakthrough in the nationalization of large-scale chemical engineering equipment in this country, where 80 percent of the parts are nationally produced, and where the level of technology has reached an international level of the late 1970's or early 1980's. Eight key pieces of equipment for the Beijing electron-positron collision machinery, such as the magnets, high-frequency machinery, and klystron, have already been completely and successfully finished.

12586
CSO: 4008/2022

HIGH TECHNOLOGY MANAGEMENT CLASSES OFFERED IN BEIJING

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 25 Nov 86 p 3

[Report by Liu Yongya [0491 3938 0068]: "High Technology Enterprise Management Training Classes Will Begin in Beijing"]

[Text] Three short-term training classes and discussion classes aimed at training high technology enterprise operations and management personnel will begin in Beijing the middle of December 1986, and have recently been soliciting students.

Scientists and economists believe that the intellectual and technical abilities of people today are in the process of changing into leading factors for economic development.   To suit the needs regarding personnel of high technology enterprises currently developing in this country, the Chinese Academy of Sciences Ke-Hai New Technologies Development Center has decided to hold some classes and discussion groups.   It is said that this plan is approved and supported by the State Education Commission, the State Science and Technology Commission, and departments of the Chinese Academy of Sciences.

Liu Jianfeng [0491 0494 1496], assistant general manager of this center, described all this to reporters the other day, saying that the 3 classes and discussion groups to be held in the first term are: an enterprise high-level secretarial and public relations class, a Western financial accounting class, and a high technology enterprise management class.   The methods of teaching will use such things as lectures on a subject, analysis and exercises with actual examples, comments and discussions, role simulation, and skill training.   Instructors will be people who have studied or trained at MIT and Harvard, as well as some overseas enterprise operations management specialists invited for lectures.

12586
CSO: 4008/2022

RESEARCH INSTITUTION FUNDING DISCUSSED

Beijing GUANGMING RIBAO in Chinese 9 Dec 86 p 1

[Report by Zhu Wenqin [2612 2429 3830]: "As Quickly As Possible, Change the Situation in which Investments in Higher Institutions Are Too Few, and Establish a New System in which Science and Technology Are Closely Integrated with Education"]

[Text] This reporter came to realize during his investigations that funding for research in higher institutions is too little and that calls for the adjustment of this situation of unreasonable investment are quite vociferous.

When comparing the total amounts of funds for higher institutions on the one hand and independent research organizations on the other, there is a great disparity in the figures. In 1985, science research funding for higher institutions was not even one-tenth that for research organizations! But from the point of view of research strength and achievements and results, the higher institutions are not backward. Based on 1985 statistics, there were 355,000 scientists and engineers in science and technology, agriculture, and medical fields in 759 higher institutions, some 1.54 times that of the 231,000 in research organizations, and the number of people in high level technical posts at higher institutions are 67 percent of those throughout the country. Taking another look at the research achievements of both for 1985, in papers alone, there were 63,000 from the higher institutions and 73 patents approved; there were 24,000 papers from the research organizations and 19 patents approved, while for per capita science research funding, the research organizations had 8.3 times as much as did higher institutions.

Why is science research investment in higher institutions not in keeping with its research strengths and contributions? The main reasons are due to the irrational system. Science research for a country should be closely combined with education, something that is a shared experience with all countries of the world. But research efforts in this country are of a system that has been separate from education for decades. National, sector, and local science research operating expenses are only allocated to research organizations, while science research operating expenses are allocated from education operating expenses. Therefore, the amount is extremely limited. Although some advances were made in 1979, the actual problem has never been resolved.

After the promulgation of the resolution to restructure the science and technology system, reforms of the allocation system were begun, but looking at this from the point of view of some primary channels of allocation for current higher institution research funding, over a relatively long period the situation will be difficult to improve. First, this country's research operating expenses. For example, although 36 higher institutions directly affiliated with the Education Commission have channels for research operating expenses, consequently providing a guarantee for growth of funding, because this growth is based upon the amount of research funding in the original education funding, that means that the real significance is not great. Second, this country's science research funding system, contract system, and bidding system. These new methods allow higher institutions to be able to win funding through competition and the avenues for winning funding have broadened, but when higher institutions are compared with their competitor-- the research organizations, their research operating expenses are fewer and conditions in their laboratories are lacking, for which reason both parties are not competing under equal conditions, and the higher institutions are invariably in a less advantageous position. And again, when sectors and local areas organize major problem solving tasking, because of the influence of traditional concepts such as "department ownership" and "fertilizer does not flow outside," when higher institutions take on their share of projects, that is not only very much a strain--when teachers and academic leaders are running all around fighting for projects, but there are always going to be failures and rejections. Teachers at Qinghua University came up with the following three sayings: when many science and technology plans are being formulated by the state, higher institutions are treated as "having foresight," and professors are invited to participate; when formulating projects, higher institutions are treated as "lacking foresight and behind the times"; when awaiting funding for allocated projects, higher institutions are "unconscious." These teachers are acutely aware that the position of higher institutions in national science research activities has been too little respected.

In the current situation where research funding is low, this has greatly affected a better start for science research at higher institutions, has affected the motivation of enthusiasm among the many teachers and full use of their potential, it has affected the undertaking of basic science research of the front ranks by schools, and has affected the domestic training of high level skilled personnel in large numbers, the results of all of this being quite serious.

How can we improve this problem where science research funding for higher institutions is insufficient? The following suggestions have been made by teachers and pertinent departments based on the current situation:

1. Gradually change the situation in which there are too many research organizations independent from enterprises and higher institutions, and establish a new system for science and technology where science and technology are closely integrated with education. Prohibit and overcome the strengthening and unique complexes and unique systems of independent science research organizations. Promote the extension of research organizations that are engaged in basic and partially applied research into higher institutions

and the spread of research organizations engaged in development into enterprises, all of which will enable the closer integration of science and technology with the economy and of science and technology with education. During the current stage, cooperation and association can be of different formats, as for example with jointly run research organizations or laboratories, associated problem solving, and cooperative training of skilled personnel, which will advocate concurrent posts back and forth among specialists and scholars, and cooperative research.

2. Restructure the research allocation system to gradually rectify the situation of unreasonable investment. Currently, on the policy and investment levels, the state should adopt supporting policies for research funding at higher institutions, as for example in giving preference to an increase of research funds and purchasing of equipment and instruments. In the implementation of the funding system and contract system, distinguish treatments, and subsidize the higher institutions.

3. From a policy level, the state should guide all research forces throughout the country in their division of labors, and there should be that which is emphasized. For example, the higher institutions can emphasize developing basic and developmental research, the developing of new technologies and high technologies and cross-over technologies. The industrial sector can emphasize product development, and the military industrial, local, and science academies can clarify their research emphases by proceeding from reality. Only in this way can we make the development of the scientific mission in this country more reasonable and more effective.

4. Encourage higher institutions to "eat with the rest of the people," promote investments in higher institutions by enterprises, and develop lateral relations.

12586
CSO: 4008/2042

NON-GOVERNMENT RESEARCH INSTITUTES FLOURISHING

OW080742 Beijing XINHUA in English 0726 GMT 8 Feb 87

[Text] Beijing, 8 Feb (XINHUA)--China now has nearly 10,000 non-governmental
scientific research institutes, which employ a total of 200,000 people,
the WORKERS' DAILY reported today.

These institutes are run by the scientists and technicians, who have given
away their "iron rice bowls," or life-long jobs, in state-run research
institutes, colleges and government offices since 1980.

"The non-governmental institutes, run either collectively or by individuals,
have helped spread scientific and technological results, and improve the
technological standards of smaller urban businesses and rural factories."

For example, 141 such institutes in Beijing's Haidian district have completed
3,700 technology development and service projects. They provided many
job opportunities and turned 50 million yuan (about U.S.$13 million)
in profits and taxes to the government between January 1984 and March 1986.

Wang Xiangzhong founded a biochemical product research institute in
Shanghai 3 years ago. Since then he has helped rural factories produce
quality biological preparations and has developed an early-stage stomach
cancer diagnosis reagent.

/9604
CSO: 4010/2009

LOCAL AUTHORITIES TO CONTROL RESEARCH INSTITUTES

OW101747 Beijing XINHUA in English 1514 GMT 10 Feb 87

[Text] Beijing, 10 Feb (XINHUA)--This year China's research institutes now under central authorities will be shifted to enterprises, enterprise groups, industrial sectors and municipal authorities, a senior official announced here today.

"In a bid to better serve China's economic construction," he said, "the change will vitalize the institutes and encourage the enthusiasm of scientists and technicians."

"The shift should solve the problem of technician understaffing and insufficient research funds in those enterprises and institutes under government offices," said Ceng Xianlin, vice-minister of the State Science and Technology Commission, at a national meeting of civilian science and technology entrepreneurs.

"A sign of major advancements in science and technology reform is the nearly 10,000 civilian-run research institutes formed over the past years," he said.

He hopes entrepreneurs will play a more active role in promoting science to better serve the economy and the integration of research and production.

China has allowed scientists and technicians to contract projects and run enterprises on a lease basis, and 390 research institutes now have adequate funding.

Last year, technology markets throughout China made deals for the transfer of technology worth 2.06 billion yuan (U.S.$557 million). The state has also invested 2.2 billion yuan (U.S.$595 million) to spread 4,000 new technologies to rural areas under the "spark plan."

The "spark plan" was introduced nationwide in 1985, designed to set off the necessary "sparks" to start a technological revolution in China's rural areas to help boost their economic development.

At the meeting, attended by 70 people, Gao Zhenning, vice-president of the Scientific and Technological Association, pledged to support scientists and technicians to run businesses.

/9604
CSO: 4010/2009

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SCIENTISTS, TECHNICIANS URGED TO RUN BUSINESSES

HK110725 Hong Kong ZHONGGUO XINWEN SHE in Chinese 1227 GMT 10 Feb 87

[Report by correspondent Qin Lang (4440 2597): "Zeng Xianlin Encourages Scientists and Technicians to 'Talk Business' and to 'Do Business'"--ZHONGGUO XINWEN SHE headline]

[Text] Beijing, 10 Feb (ZHONGGUO XINWEN SHE)--The emergence of locally-based science and technology entrepreneurs is an important indication of the great progress made in the reform of China's science and technology structure. There will emerge a batch of entrepreneurs with courage and insight, as well as wide knowledge, from among our scientific and technical personnel.

Zeng Xianlin, vice minister in charge of the State Science and Technology Commission, made these remarks at a national forum of locally-based science and technology entrepreneurs which was held today. Representatives from 26 provinces, municipalities, and autonomous regions of the country attended the forum. Over the next several days they will exchange information on the development of the science and technology businesses run by local people or by individuals and, at the same time, initiate the formation of their own organization--the China Association of Locally-Based Science and Technology Entrepreneurs.

Zeng Xianlin said: At present many scientists and technicians in our country are hampered by the outmoded notion of looking down upon business. Many talented people are unwilling to run businesses, assuming that engaging in science and technology businesses run by local people has no prospects. He appealed to people to break through these outmoded notions.

The emergence of nongovernmental locally-based science and technology businesses reached its climax around March 1985, when the CPC Central Committee promulgated a resolution on furthering the reform of the science and technology structure.

Interested people here predicted: In China there will emerge a new upsurge in science and technology businesses run by local people or by individuals. At the beginning of this month, the State Council promulgated "Several Regulations on Furthering the Reform of the Science and Technology Structure." Scientists and technicians are encouraged to operate enterprises under a contract scheme and to run technological development, service, and trade agencies through either job transfer or resignation.

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CSO: 4008/2069

SIX FIRMS MERGED AS 'CHINA COMPUTER DEVELOPMENT CORPORATION'

Paris AFP SCIENCES in French 18 Dec 86 p 20

[Text] Beijing--On 12 December, the Chinese Ministry of Electronics formed the China Computer Development Corporation [CCDC] for the purpose of merging six of the Chinese data processing firms and cooperating with the other four. Its objective is to create a Chinese equivalent of IBM, said Mr Wang Zhi, its head, on 13 December.

"Our aim is to become a data processing giant, like IBM in the United States," said Mr Wang, adding that the company's activities will include not only technological research and the production of all kinds of computers, but also the training of data processing specialists and the creating of a national sales and service network.

The CCDC will also be officially empowered to import and export computer accessories and parts, to incorporate foreign funds, and to supply facilities and hardware for research.

The creating of the CCDC coincides with a policy of incentive measures aimed at fostering the development of the data processing industry in China, which include: tax exemptions for firms importing software, authorization to issue shares, greater freedom to recruit technicians, including foreigners, for the data processing companies, etc..., said Mr Guo Pingxin, head of the Research and Data Processing Technology Board.

Recently CHINE NOUVELLE emphasized China's need to invest sizable funds in the production of computers fulfilling the country's needs, instead of fostering the development of large computers, mid-range machines, and small and microcomputers.

The Galaxy line, the largest of the Chinese computers, announced several years ago, was never put on the market, did not meet the country's needs, and was unable to compete on the international market, say the Western experts.

9238
CSO: 3698/181

S&T OPERATIONS MANAGEMENT DISCUSSED

Beijing BEIJING KEJI BAO in Chinese 5 Dec 86 p 1

[Report by Chen Zhiqiang [7115 1807 1730]: "Bright Prospects for Operations Management at Institute"]

[Text]   A military industrial institute began in May 1984 to restructure its science and technology system, that year it reduced its request to the government for operating expenses by 60 percent.   Last year it was able to provide its entire operating expenses.   This year, the estimated gross income for the military industrial and civilian research projects developed by this institute could reach 20 million yuan, with a profit of 10 million, and a per capita creation of profit of nearly 8,000 yuan.   This novel event occurred at the Ministry of Aeronautics Institute No 23.

Establishing senior economist posts is no longer a rare event in enterprises; but for an institute to also establish the post of senior economist is still quite a new thing.   This affair also occurred at the Ministry of Aeronautics Institute No 23.

Why did this institute establish the post of senior economist?   Did they experience something in their operations that could be used by others? Deeply interested, this reporter visited assistant senior economist Comrade Ji Bolin [4764 2672 2651] one noon at the Ministry of Aeronautics Institute No 23.

As soon as we had met, Comrade Ji Bolin took the initiative in explaining: "In the restructuring of the science and technology system our leaders felt that if we were to handle the restructuring well and enhance the real power of the institute in all aspects of research, then we must carry on with operations, for which reason we have established the post of senior economist to help the plant director accomplish operations work." These institute leaders have foresight and sagacity, and they not only understand conceptually the importance of operations, but also have implemented this in their actions. This institute not only established the post of senior economist, but also an operations office with nearly 30 workers, and Comrade Ji Bolin then took over responsibility for this office.   Policies of foresight have already borne substantial fruit.   This year, the gross income for this institute from

research projects they had developed on their own and profits therefrom increased 15.6 and 14.5, respectively, over that of 1983 before the restructuring had begun.

"In operations work, this institute implemented development at the two levels of the institute and the office. We contract on behalf of the institute for major national projects and contracts of greater cost, as well as for projects that can only be accomplished by several research offices working together, where other research contracts are signed by the particular research offices." Assistant senior economist Ji Bolin went on with his description, saying, "Each year within the institute we contract with each research office for the quotas for research projects to be developed by that office, as appraised and determined in accordance with the total wages for that office. Of the portions over quota, the institute and office split 6 to 4, respectively. The shares for the research offices are arranged in the proportion of 5:3:2 for research development funds, collective welfare funding, and bonuses, respectively." The two-level mode for development operations by Institute No 23 has been quite productive. Last year, of the 73 self-developed research projects that were completed by the entire institute, 90 percent were developed by the research offices; last year, of the 5.4 million yuan profit obtained by the entire institute for self-developed research projects, 1.3 million yuan was generated by the individual research offices. Because the research office has a collective welfare fund, when it came time to allocate housing last year, there were more households in distress in the research offices, the housing allocation was insufficient, so the research offices used their collective welfare funds to buy housing from the institute, allowing more of the housing difficulties for science research personnel to be resolved.

"If the burden as directed by the state regarding military research tasking were greater, how would you deal with the contradiction with self-developed research projects," I asked.

"Then we would first of all guarantee completion of nationally directed research tasking." Assistant senior economist Ji went on to say, "The tasking directed by the state was indeed greater this year, so we made the appropriate adjustments in our bonus policies, raising the standards for bonuses on this portion of the tasking. We also instituted expenses responsibility for the military research tasking directed by the state to save on what was awarded."

Comrade Ji Bolin, already 50 years old, graduated in 1958 from the Chengdu Institute of Telecommunications Engineering. In 1984, he was transferred from research to the post of assistant senior economist in operations. As our discussion was about to conclude, he said to me with great feeling, "Our institute is not only to produce achievements and skilled personnel, but also products and results. In the 10 years of work I still have left, I hope to still do economics. The operations practice during this period has allowed me to understand that doing a good job at the operations management for research is the same as producing results."

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REGULATIONS ISSUED ON REFORM OF S&T MANAGEMENT

OW090634 Beijing XINHUA Domestic Service in Chinese 0203 GMT 3 Feb 87

[Text] Beijing, 3 Feb (XINHUA)--The State Council recently promulgated "Regulations on Furthering Reform of the Science and Technology Management System." It has decided to further relax restrictions on scientific research institutions this year in order to promote the assication of scientific research and production at various levels and in various ways and to promote the close integration of science and technology with the economy. It has also decided to further reform the management system of scientists and technicians and to relax policy restrictions on them in order to create a favorable social environment in which to bring their role into full play.

The State Council holds that since the CPC Central Committee decided to reform the system of science and technology management more than a year ago, a series of measures have been taken to change how funds are allocated for science and technology, to open a technology market, to give greater decision-making powers to scientific research institutions, to promote the association of scientific research and production, to increase enterprises' abilities to absorb technology and undertake development projects, and to reform the management system of specialized and technical cadres in order to implement two strategic principles. The two strategic principles are that economic construction is to rely on science and technology, and scientific and technological work must be geared to the needs of the economy. These measures have won the understanding and support of society and large numbers of scientists and technicians and have achieved initial results. It should be noted, however, that the situation in which science and technology are divorced from production has not been changed once and for all. The structure of scientific and technological departments basically has not changed, and the closed system still exists. Major scientific research institutions are still administrative departments' appendages, and there is no interdependent relationship between such institutions and the national economy. A large number of qualified personnel are still kept in major scientific research units under the State Council departments and institutions of higher learning. Light and textile industries, commerce, localities, and the agricultural front are very short of scientific and technical forces. Owing to a lack of effective measures and policies in promoting the integration of

scientific research institutions with enterprises, a considerable number of such institutions have taken the road of self-improvement and have seldom linked themselves closely with enterprises. The tendency of factory-run scientific research institutions trying in every possible way to separate themselves from their factories is still developing, and various departments tend to further strengthen their control over scientific research institutions after the reorganization of departments and the transfer of enterprises to lower levels.

As the economic structural reform is deepening and the structural reform of state administration is developing step-by-step, it is necessary to take a new step in reforming the system of science and technology management in 1987, while continuing to implement the various reform measures announced by the State Council in this regard, in order to meet the needs of the developing situation.

On adopting more flexible policies on scientific research institutions, the State Council stipulates:

1. All departments under the State Council should separate administrative duties from those in scientific research, streamline their administration, delegate more power to lower levels, and gradually put scientific research institutions under enterprises, groups of enterprises, industries, or major cities. The state management of scientific research institutions should shift from direct control to indirect management, with the state giving policy guidance and providing coordinating services.

2. Most scientific research institutions that center on the development of new technology, especially those engaged in the development of new products, should gradually join enterprises or groups of enterprises or associate themselves closely with the latter. Funds for research and development should gradually come from the sales income of the enterprises or groups of enterprises.

3. Other scientific research institutions engaged in the development of new technology should adopt various forms to serve economic construction. A few such institutions which have a considerable bearing on industrial development may become centers for the development of new industrial technology. Some of these institutions may become technological development departments or regional technological development and service centers by gearing themselves to the needs of small and medium-sized enterprises or village and town enterprises. Some of these institutions may join designing and engineering units in organizing themselves into technology and engineering contracting companies. Still other such institutions may have enterprises join them and develop themselves into enterprise groups with scientific research leading the way or scientific research-production enterprises. Such institutions should depend for their funds mainly on income from the services they have provided for enterprises and society.

4. Scientific research institutions should streamline their administrative structure and reduce their personnel. Generally speaking, no new institutions will be created and institutions will not increase their personnel

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in the next few years. The contingent of scientists and technicians should be readjusted by transferring some of them, and by replacing old scientists and technicians with young ones, in order to build a contingent of competent scientists and technicians.

5. Reduction of operating funds for scientific research should be properly speeded up. Retention of funds for the issuance of monetary awards by scientific research institutions, and the tax-free portion of such awards, should be linked to the scale of reduction of operating funds allocated for scientific research. After wage reform, scientific research institutions may use their income to pay back funds scientists and technicians have raised themselves. Enterprises should adopt encouraging measures to stabilize and develop the contingent of scientists and technicians and to attract scientists and technicians to work for them.

6. It is necessary to implement in an all-round way the director responsibility system. The director of a scientific research institution is responsible for all its operations and its administration. In any scientific research institution which has made remarkable achievements in carrying out reform and creating fairly good economic and social benefits and has been self-sufficient in operating funds, the income of a director or deputy director may be two or three times more than the average income of a worker or staff member.

7. The gradual separation of the ownership of a scientific research institution from the right to manage and operate it is an important principle in deepening the reform of scientific research institutions and gearing them to the needs of the economy. A scientific research institution engaged in the development of new technology, which has a small number of personnel and a limited amount of fixed assets, may try out the system of running business by lease or contract. A scientific research institution engaged in the development of new technology, with poor management and poor economic results, may also try out the system of running business by lease or contract. In the course of reform, bug and multipurpose scientific research institutions should explore new ways of management and operation, such as by splitting them into several units with independent accounting systems meeting the needs of various trades or enterprises, by merging themselves into enterprises or groups of enterprises, or by permitting collectives or individuals to run them under lease or contract. It is necessary to guarantee that, while observing relevant state regulations, the lessee or contractor can fully exercise his right to operate and manage. It is also necessary to protect his legitimate interests obtained under the contract.

On further reforming the management system of scientists and technicians and adopting flexible policies regarding scientists and technicians, the State Council points out: All concerned departments should organize scientists and technicians in a planned way, or encourage some of them to leave scientific research institutions, institutions of higher learning, or government organizations—through transfer, leave without pay, or

resignation--for towns and rural areas to run small or medium-sized state-owned enterprises, or collective village or town enterprises, under lease or contract; to set up and manage organizations for technological development, technical services, and technological trade; and to set up and manage small and medium-sized joint ventures and stock companies. These scientists and technicians should be allowed to get their legitimate income while creating wealth for society. Those who become shareholders through their technological contribution should draw dividends according to the number of shares in their possession. Scientists and technicians who can lead people in getting rich should be allowed to become better-off themselves. Governments and concerned departments at all levels should adopt a flexible policy toward them in terms of wages, welfare, technical duties, household registration, and party membership credentials and support them in terms of credit, venture investment, raising of funds through stock sales, and taxes.

Adopting flexible measures with regard to scientists and technicians will contribute to speeding up the marketing of technological achievements, promoting the development of new technology and industry, and fostering entrepreneurs for developing the socialist commodity economy as well as scientific and technological undertakings.

In accordance with these regulations and with actual conditions, and proceeding from the requirements for scientific and technological as well as economic and social development, the concerned departments under the State Council and the various regions may work out detailed rules for the implementation of these regulations. They should firmly and systematically promote the deepening reform of the science and technology management system.

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ROLE OF SCIENCE IN MODERN SOCIETY DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 3 Dec 86 p 8

[Extract from ZHONGGUO KEJIBAO 19 Nov: "Science and Technology Are At the Core of Modern Culture"]

[Text] It is said that science and technology should be seen as being among the originators of modern civilization, or it could be said that they signify the emergence of a new culture. It is my opinion that aside from the history of world civilization, where the appearance of science and technology has been much written of, the progress of science and technology, the soaring of science and technology, together with the transformation of science and technology into production forces has become the clearest indication that they have gradually changed Western civilization. In terms of customs, the newest achievements of science and technology are invariably treated as markers by which to separate periods of time. For example, there was the Iron Age, the Bronze Age, the Age of Steam Engines, the Electronic Age, etc. These things have undoubtedly placed technology in the most appropriate position. Science and technology have become the cultural emissaries through which to propagate the reappearance of beauty, and have also become harbingers that today will be called the age and culture of "man and computer, information and living things."

Then what brought about the basis for the social environment of today where "things change with each passing day"? It has been the progress of science and technology that I feel to be that basis. For example, the development of the universe and space undertakings by mankind indicates that man has the capability to enter celestial bodies beyond earth, to vary the space in which he lives, and to open up research into all the superiorities within view; the exploration by mankind of living things and of secrets of the atom shows the invincibility of mankind in conquering nature. Mankind must recognize and understand nature, mold and restore itself, always depending upon science and technology. The constant demands by mankind on safety and the excellence of society and the environment also explains that among many related factors, the renewal of science and technology provides a reliable guarantee for social stability and safety. The degree of aspiration by mankind for wealth and culture indicates that the integration of "science and culture" will bring forth the resplendent reality of tomorrow.

Therefore, to say that science and technology are the core of modern culture is certainly not an exaggeration, and the function it serves in modern civilization is more and more important. A great number of facts have proven that the chief token by which to measure progress in today's society should be science and technology.

SUCCESS OF CAS TECHNICAL COMPANIES REPORTED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 25 Nov 86 p 4

[Report by Meng Xiangjie [1322 4382 0267] and Wu Ming [0702 2494]: "Chinese Academy of Sciences Large Group of Development Companies Form a Bridge"]

[Text] Over the past few years, there has appeared in the Chinese Academy of Sciences (CAS) a large group of technical development companies that have taken another step toward erecting a bridge between research and production. It is said that at present there are already 80 technical companies run by CAS academies and institutes, 59 run together with localities, and 6 technical companies run together with the regions of Hong Kong and Macao and with foreign countries.

These companies have become windows for the integration of science and technology with the economy and channels through which technical achievements flow into the fields of production.   In the past, many technical achievements and personnel that were sheltered in the science academies are entering social and economic areas through technology companies of various forms, which serves to enrich society.

Presently, some of the companies being run by CAS have formed technical industrial entities that are a coordinated process of science research, development, production, and marketing. The Ke-Hai New Technology Development Center run jointly by CAS and the Haidian district of Beijing Municipality has broadly initiated new technology and new product development, production, technical services, and training operations for industries such as electronics, light industry, and machinery. From its opening in May 1983 through the end of 1985, 100 items have been disseminated, there have been 84 computer applications developed, there are users in every province, city, and autonomous region throughout the country aside from Tibet and Taiwan, and some items have reached advanced international standards.

A group of companies are backed by institutes and cater to society, and by disseminating the original "exhibition item" or "sample" to industrial departments, this has allowed science research achievements to rapidly generate economic and social results.

More than a year after the founding of the CAS Microbiology Development

Company, the rights to 64 achievements were transferred to 20 provinces, cities, and autonomous regions throughout the country. One black aspergillus sacchrafication enzyme used only in the production of white spirits and alcohol is already being used in several hundred alcohol plants within this country, and according to statistics can accumulate added annual income of 190 million yuan, with a savings of 220,000 tons of grain.

One CAS leader in charge of company management feels that when comparing these technical companies with the institutes, their market concept is stronger, they have a deeper understanding of commodities, and the efficiency rate at which they disseminate technologies is also higher. If development continues, some of the companies could become industries or technology "warehouses" for fields, and some companies would then form technological-industrial blocs in aspects such as computers, biology, and materials, allowing science research and production to constitute an organic close integration.

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SHANGHAI MUNICIPALITY S&T STATISTICS THROUGH 1985

Shanghai SHANGHAI TONGJI NIANLIN [SHANGHAI STATISTICAL YEARBOOK] in Chinese
1986 pp 252-254

[Text]

Total Natural Science Specialists in Public Units

	1980	1981	1982	1983	1984	1985
natural science specialists, totals	247,688	262,496	284,399	321,872	348,499	371,824
engineering technicians	118,206	127,298	137,198	173,820	194,041	207,639
agricultural technicians	1,815	2,088	2,282	2,364	2,595	2,918
hygiene technicians	57,977	62,744	67,116	70,272	73,554	77,729
science researchers	24,623	26,920	31,338	26,905	25,549	27,444
teaching personnel	45,067	43,446	46,465	48,511	52,760	56,098
specialists of all categories proportion of total (%)						
engineering technicians	47.7	48.5	48.3	54.0	55.7	55.8
agricultural technicians	0.7	0.8	0.8	0.7	0.8	0.8
hygiene technicians	23.4	23.9	23.6	21.8	21.1	20.9
science researchers	10.0	10.3	11.0	8.4	7.3	7.4
teaching personnel	18.2	16.5	16.3	15.1	15.1	15.1
Avg. number of natural scientists & technicians per 10,000 staff and workers	216.0	225.7	240.9	269.6	289.3	305.6
Avg. number of natural scientists & technicians per 10,000 staff and workers	704.0	721.6	766.2	852.6	920.5	970.0

| | totals | among which: | |
		high level science specialists	mid-level science specialists
Grand totals	371,828	6,756	79,171
proportion (of total, %)	100	1.8	21.3
engineering technicians	207,639	1,787	49,861
agricultural technicians	2,918	17	374
hygiene technicians	77,729	1,290	6,201
science researchers	27,444	1,260	12,392
teaching personnel	56,098	2,402	10,343

Number of Social Science Personnel in Units of Public Ownership

	1980	1981	1982	1983	1984	1985
total numbers of social science specialists	83,082	89,050	95,056	148,829	163,572	181,405
among which:						
science researchers	876	1,084	1,346	1,512	1,510	1,795
teaching personnel	40,136	40,217	41,979	87,797	87,150	94,509
accountants	27,753	30,385	32,620	34,246	42,609	50,661
statisticians	5,235	7,000	8,025	6,844	12,068	14,338
news and publishing personnel	1,866	2,309	2,570	2,808	3,109	3,289
translators	1,373	2,432	2,823	3,047	3,761	3,909
literary and artistic personnel	5,793	5,536	5,537	5,506	5,571	5,797
specialists of all categories percentage of totals (%)						
science researchers	1.0	1.2	1.4	1.0	0.9	1.0
teaching personnel	48.3	45.2	44.2	59.0	53.3	52.1
accountants	33.4	34.1	34.3	23.0	26.0	27.9
statisticians	6.3	7.9	8.4	4.6	7.4	7.9
news and publishing personnel	2.2	2.6	2.7	1.9	1.9	1.8
translators	1.7	2.7	3.0	2.0	2.3	2.2
literary and artistic personnel	7.0	6.2	5.8	3.7	3.4	3.2

note: 1093-1985 statistics for social science specialists include elementary school teachers

	totals	among which:	
		high level science specialists	mid-level science specialists
grand totals:	181,405	1,082	8,711
proportion (of totals, %)	100	0.6	4.8
among which:			
science researchers	1,795	206	441
teaching personnel	94,509	804	3,903
accountants	50,661	10	1,745
statisticians	14,338	--	198
news and publishing personnel	3,289	13	696
translators	3,909	7	369

All City Scientific and Technical Achievements

	1980	1981	1982	1983	1984	1985
S&T achievement totals	624	559	650	736	1,585	1,957
new materials	144	100	112	106	130	106
new equipment	175	200	248	269	606	463
new techniques	81	91	114	107	110	472
new sciences & technologies	74	42	60	74	388	
agriculture	28	44	32	39	18	97
medicine & hygiene	57	40	66	85	137	145
basic theory	20	17	18	34	102	125
electronic devices	45	25		22		495
new products					57	
other					28	54

note: 1980-1984 is for totals of important scientific and technical
achievements, 1985 is for the totals for primary scientific and technical
achievements

City-wide Scientific and Technical Achievements

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---------------------------------------------------------------------
2000                                                        1,957
                                                             XX
1800                                                         XX
                                                             XX
1600                                              1,585      XX
                                                   XX        XX
- - -                                              XX        XX

800                                                XX        XX
         694               624           650   736 XX        XX
600      XX      502       XX    559     XX    XX  XX        XX
         XX      XX        XX    XX      XX    XX  XX        XX
400      XX      XX        XX    XX      XX    XX  XX        XX
         XX      XX        XX    XX      XX    XX  XX        XX
200      XX      XX        XX    XX      XX    XX  XX        XX
         XX      XX        XX    XX      XX    XX  XX        XX
0        XX      XX        XX    XX      XX    XX  XX        XX
         1978    1979      1980  1981    1982  1983 1984     1985
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12.9% Among the 1,957 important scientific and technical achievements, 253 reached advanced international levels or are among international pioneering achievements

13.6% 265 other items

73.5% 1,439 attained advanced domestic levels or are among domestic pioneering achievements

SHANGHAI INSTITUTE DIRECTORS IMPACT ON REFORM DISCUSSED

Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 28 Nov 86 p 4

[Text] Shanghai, 27 Nov (XINHUA)--The reforms call out for new people, for new people promote the reforms. A group of 40-50 year-old scientists and technicians in Shanghai have been in positions of scientific and technical leadership for years now, and this more than 600-strong contingent of institution heads has been tempered, is maturing constantly, and has become a group with a certain amount of style among contemporary reform pathbreakers.

These new institution directors have had in the reform both bold expansion and also meticulous considerations. Using the special manner of thought of scientists, they have implemented each reform step by step, seeking only practical results. In the spring of 1984, the Shanghai Metallurgy Institute of the Chinese Academy of Sciences, based on its inventory of topics needed for national economic construction, reduced the number of its total research topics from more than 120 to 73. When the topics had been reduced, the institute directory, Zou Shichang [6760 0013 2490], promptly thought of the number of scientists and technicians who would have no topics, and said that since the channels for the movement of personnel are not yet particularly open, we will not want to "suspend" the excess personnel and force them to find their own way! Thereupon, he arranged for these people to take up the efforts of lateral relations and technology development for that institution. Correct thinking brought results that were pleasing to all. And because the topics were well selected, there was able management, and people did their best, in 1985 the entire institute obtained 45 scientific and technical achievements, which was the most abundant year for achievements in the history of the institute, and income from technology development was nearly 3 times that of last year.

With the development of reform trends, there are more and more things the institute directors have needed to handle. In the past, the primary responsibility for institute directors has been to arrange work for the entire institute in accordance with tasking passed on from above. That is no longer the case. The many vertical contracts in this country require that each institute bid for them, and the institute's lateral duties require that it seek expansion, and the many different relations from the changes in the reforms require that each be adjusted. These institute directors of the 1980's bring together the three aspects of science research, development, and

operations management into one person, and they have met each complicated situation with skill and ease. In recent years, both foreign and domestic shipping markets have been depressed, which has caused the Shanghai Institute No 708, which primarily takes on the overall designs for shipping research, to be faced with a grim challenge. In 1984, as soon as Lian Gan [4886 3227], assumed the position of institute director, he and several deputy institute directors thought things out together, they quickly came up with the policies of trying hard for vertical tasking and of searching far and wide for lateral outlets. On the one hand, they organized their strengths to participate in the bidding for pertinent projects and bids both domestic and foreign, and on the other hand shared the responsibility with the deputy directors for leading scientists and technicians in a thorough understanding of technology information, stimulating the informal discussion of business. In 1985, vertical and lateral tasking throughout the institute was completed, total income from which reached more than 10 million yuan, and this year another 138 contracts of various sorts were signed. Scientists and technicians have been pleased to notice that science institute directors like this one in Shanghai are not just bookworms who understand specialties, but rather more and more among them are in the process of becoming jacks-of-all-trades who can both do science research and who also understand operations, at the same time understanding legal policies and management science.

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CRISIS PREDICTED FOR SHANGHAI TECHNICAL BASE

Beijing GUANGMING RIBAO in Chinese 10 Dec 86 p 1

[Report by Wen Yi [2429 0001] and Qi Zhang [7871 4545]: "S&T Development in Shanghai Faced with Potential Crisis"]

[Text] The new technological revolution has brought an unprecedented pattern to developments in the world economy, and has at the same time provided the developing China with a golden opportunity to make its place in the ranks of the world's advanced. Because of this, many countries, whatever their social system or ideology, are all doing the best for their nations, placing science and technology advances in the forefront of economic development strategies. With this background of major trends in the world, how is Shanghai to develop its science and technology? From an analysis of certain phenomena, we have seen some potential crises that are quite worrisome.

1. Science research funds will be unable to have their rightful guarantee.

"In our four modernizations, the key is science and technology." This slogan has been in effect for many years, but in actual planning arrangements it has not been realized. According to statistics, in the 6 year period from 1980 through 1985, the three-item expenses for science and technology in Shanghai as proportions of local financial expenditures were 3.5, 2.7, 2.5, 3.7, 3.9, and 2.0 percents, respectively, which for the most part has been declining. During this same period, a prominent problem facing higher institutions, institutes, and enterprises in Shanghai has been the serious deficiency in science research outlays. According to a sampling survey we took of 11 institutes of a certain industrial sector, their vertical contract funding for 1985 had been reduced 66 percent over that of 1984. The situation of financial straits for science research funding has, on the one hand, kept some valuable topics from a penetrating study; and on the other hand, has made many scientists and technicians run all over the place to make sure of funds, "begging" everywhere, spending more time accumulating funds than in research. No wonder some scientists have issued the warning: If we go on like this, Shanghai will become a city without science and technology in its economy.

2. Autonomous research and development in science and technology cannot obtain strong support

When comparing the levels of science and technology and of industrial technology in this country to those of developed countries abroad, the gaps are full-scale and wide, and this is a grim fact that cannot be avoided. During the period of the sixth 5-year plan, Shanghai spent more than $1 billion importing thousands of advanced technologies, techniques and equipment, and production and assembly lines. But to date, in guiding ideology and in the spending of funding, the tendency to import, absorb, and innovate exists in differing degrees in some sectors, and with their eyes on the economic results over the short term, they do not respect an in-depth deployment of science and technology and are ignoring the fostering and disposition of scientific and technical reserve strengths. Importation can only temporarily reduce the gaps; if we are to shorten and eliminate those gaps fundamentally, we can only rely upon our own autonomous research and our development and innovation on imported technologies. This easily understood principle is known to all, but it is very difficult to actually implement. Based on statistics from a major industrial bureau, during the "sixth 5-year plan, the ratio between investments in imports and expenses for assimilation were 200:1. This bureau is a department in Shanghai that has done a better job at importing technology, absorbing, assimilating, developing, and innovating on it, but for reasons of funding that can only be "doing Buddhist rites in a snail's shell," for it is difficult to make any headway. The tendency to emphasize importation, assimilation, and innovation is also manifest in how to respect and make the most of the enthusiasm of Shanghai scientists and technicians. According to our sampling survey of 1,916 scientists and technicians, two-thirds of those surveyed had never participated in the absorption or assimilation of imported technologies. Some high level engineers summed up this phenomenon in the phrase: "While advanced technology depends upon importation, high level intellects go to 'towns and townships'." In light of this situation, some industrial specialists and scientific and technical personnel are deeply worried, saying: in accordance with the current tendencies, the following vicious cycle will naturally arise: import--shorten gaps--blindly self-satisfied, mark time in the same spot--the gaps lengthen--second stage of importation.

3. Work in emerging new technical industries has not received sufficient attention.

The fascination with rising new industries and high technology lies in the wide-ranging and enormous social and economic results brought to us after their industrialization. If we do not make effective unified arrangements, invest the needed funds, and formulate corresponding supporting policies to promote the industrialization of new technologies and high technologies, then we will not be able to speak of adjusting industrial structures and advancing traditional industries, and better economic development strategies can only be empty words. Actual practice has proven this point. During the sixth 5-year plan, because of a lack of funding and no implementation of supporting policies, the industrialization of rising new technologies is in a state where no one bothers to inquire, a situation where for the most part the more we struggle the more we wither. With semiconductors and devices as an example,

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the proportion of the national market held by Shanghai declined from 38.6 percent in 1983 to 21.4 percent in 1985; it is predicted that for 1986 this will drop to 15 percent. When comparing the overall quality with that of similar products from abroad, the gap has increased from the 15 years in 1983 to 18 years in 1985. In the fields of new materials, biological engineering, and fiber optic communications already targeted by the municipal government for major development, the efforts at industrialization are still in a state of marking time. Old specialists who have been engaged in the industrialization of new technologies for some years are saying: in 1958 Shanghai had to give up reluctantly what it treasured, and determined that it would close up or turn around some old enterprises to make way for emerging new industries; during the 3-year period of natural disasters, with so many difficulties for the nation, these new industries continued to receive support, and after more than 20 years of building up, the emerging new industries of that time have become the core strength of current Shanghai economic development. In comparing the national strength of that time and this, you just cannot speak of different periods like that, but why after all is not our enthusiasm for supporting new technology industries as good as it was in the past? The key is in the fact that the guiding ideology behind our economic development is too eager for quick success and instant benefit, and it lacks a tolerance for long-range strategy.

It is pointed out in the "Resolution by the CPC Central Committee Regarding Guiding Principles Behind the Building Up of Our Socialist Spiritual Civilization" that "In the world of today, science has more and more become a revolutionary force for promoting historical progress, and it has become an important indicator for representing the level of civilization for a people." This explains from an entirely new perspective that science and technology has an important position and function in social and economic development. If in the process of building toward modernization Shanghai better respects science and technology, self-consciously relies upon science and technology, realizes the spirit of the "Resolution" in true and effective planning, and then implements that planning, we believe that in that case the potential crisis currently faced by Shanghai in the development of science and technology will not become a real crisis.

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CAS SHANGHAI BRANCH ACHIEVEMENTS REPORTED

Beijing RENMIN RIBAO in Chinese 14 Nov 86 p 4

[Text]   According to a 13 November Xinhua report from Shanghai, the Shanghai branch of the Chinese Academy of Sciences has reaped "a bumper harvest of large areas" in scientific research.   There were over 200 achievements in each of the last 2 years, averaging 1 for every other day. This year already has over 150 scientific results which have passed inspection.

One day in late October, the Shanghai Institute of Technical Physics of the Chinese Academy of Sciences inspected and appraised six achievements all at once.   The one that caught most people's eyes was a spectrum analyzer which can accurately measure atmospheric transmissivity.   Personnel concerned told reporters that if this spectrum analyzer is used on weather satellites together with a scanning radiometer which they developed not long ago, it can increase not only the accuracy of observation but also the function of marine observation.

In the past few months, 18 major research results of the Shanghai Institute of Organic Chemistry passed inspection, ranking first among all research institutes of the Chinese Academy of Sciences in the Shanghai area. The trichosanthes kirilowii and protein capsule developed by this institute for animal use can make cow's placenta fall out quickly, increase conception rate by over 20 percent and reduce elimination rate by about 14 percent.   Experts think once this research result, which is the first of its kind at home and abroad, is popularized throughout the country, each year economic results will be increased at least over 30 million yuan.   In the past few days, inspection meetings have been held in all of the 15 research institutes of the Chinese Academy of Sciences in Shanghai.   Even the Shanghai Astronomical Observatory which did not have many research results in the past recently also came up with three broad-field astronomical telescopes.   One of them could be used to take astronomical pictures by adding an ordinary 135-type camera.

According to the analysis of personnel concerned in Shanghai branches, an important reason for the abundant research results of various institutes of the Shanghai Chinese Academy of Sciences is that a set of strict systems formulated during reforms to reward the industrious and punish the lazy has made scientific research personnel more conscious of competition.

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SHANGHAI MACHINE-BUILDING, ELECTRONICS INDUSTRIES DISCUSSED

Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 8 Aug 86 pp 2-5

[Article by Li Jiakang [2621 0857 1660], chairman of the board of directors of the Shanghai Municipal Society of Mechanical Engineering: "Accelerate Scientific and Technological Progress To Revitalize Shanghai's Machine-building and Electronics Industries"]

[Text] Shanghai's machine-building and electronics industries are controlled respectively by the Shanghai Municipal Bureau of Machine-building and Electronics Industries, the bureau of astronautics, the bureau of farm machinery, and the shipping industry corporation.   In addition, some medium-sized and small machine-building and electronics plants are scattered in other industrial bureaus. Civilian machine-building and electronics industries are controlled mainly by the municipal bureau of machine-building and electronics industries. Subordinated to the bureau are the 11 specialized corporations of machine tools, electric machinery, electric appliances, automobiles and tractors, petrochemical general machinery, metallurgical and mining machinery, light industrial machinery, electric industry, standardized componenets, bearing, and hydropneumatic elements; the two companies of mechanical equipment import and export and construction; eight direct subsidiaries including the Shanghai Heavy Machinery Plant, the Shanghai Machine Tool Plant, the Shanghai Diesel Engine Plant, and the Shanghai Tool Plant; five scientific research institutes including the Shanghai Machine-building and Electronics Design Institute and the Shanghai Machine-building Technology Research Institute; and seven joint ventures established with foreign investors.   At present, departments under the Shanghai Bureau of Machine-building and Electronics Industries have 420 enterprises and 350,000 staff members and workers.   In 1985, all departments under the bureau made 7.25 billion yuan in the gross value of industrial output and 1.916 billion yuan in gross profits, both ranking first in the same industry across the nation.

Many years of practice has led Shanghai's machine-building and electronics industries to believe that relying on S&T progress is the only way to revamp and revitalize Shanghai's machine-building and electronics industries.

I.

Make a Comprehensive Survey of the Development of Shanghai's Machine-building and Electronics Industries During the Sixth 5-year Plan and Fully Understand the Importance and Urgency of Accelerating S&T Progress

During the sixth 5-year plan period, under the guidance of the line, principles and policies of the 3d Plenum of the 11th CPC Central Committee and relying closely on the broad masses of engineers, technicians, staff members, and workers, Shanghai's machine-building and electronics industries made great efforts to overcome numerous difficulties in the readjustment of the machine-building industry and achieved promising results, enabling the S&T work of the industry to enter the orbit of sound development and resulting in some profound changes. To put it briefly, there have been five changes: 1) Product development work has changed from relying only on our own strength in the past to fully developing our own strength plus vigorously importing advanced foreign technology; 2) the improvement of product quality has changed from simply paying attention to the quality of the manufacturing of old products to strengthening the quality control of the manufacturing of products plus further improving technological performance through the gradual renewal and updating of products to fundamentally raise the quality level of products; 3) the implementation of product standards has changed from simply following domestic standards to vigorously adopting international or advanced foreign standards; 4) The upgrading and updating of products has changed from renewing individual products to gradually renewing the whole series of products; and 5) the understanding of the concept of technological development has changed from emphasizing only material development to paying equal attention to personnel development and training.

The concrete expressions of S&T developments in Shanghai's machine-building and electronics industries during the sixth 5-year plan" are as follows:

1. The development of a large number of new products to enable the industry to raise the level of products substantially. According to statistics, during the sixth 5-year plan, the administration trial-produced a total of 1,046 series, 3,882 varieties, 22,217 specifications of new products. Of the 3,882 varieties, 2,855 or 73.5 percent reached the 1970's international levels and 227 or 5.8 percent reached the early 1980's international levels.

2. The adoption of vigorous measures to meet international standards. By the end of 1985, 585 products of the bureau used international or advanced foreign standards, accounting for 32.5 percent of all products of the Ministry of Machine-building Industry that used international standards.

3. The absorption of advanced foreign technology to raise the technological level of enterprises. Since 1979, relevant enterprises of the bureau have imported, through various channels, 191 advanced technologies from industrially developed countries. They include 103 disembodied technologies, 68 embodied technologies, two items of technological consultation, and 18 other technologies. The Shanghai Wiredrawing Mould Plant has imported 31 advanced single-unit machines from the Federal Republic of Germany, Switzerland, England, Austria, Holland, and Japan, enabling the plant to

reduce the production processes of diamond moulds from seven to four processes and increase production efficiency by 40 percent. The three power plants of electrical machinery, steam turbines, boilers have imported from the U.S. Westinghouse Corporation whole sets of thermal power equipment and technology have capacities ranging from 300,000 to 600,000 kilowatts. The Shanghai Heavy-duty Machinery Plant has imported the whole set of technologies of 2030 cold-rolling mill from the Sieman Co. of the Federal Republic of Germany and the technology of large-scale casting and forging from Japan. These imports have substantially raised the technological level of these enterprises.

4. Conducting scientific research to solve major problems to promote the development of products. During the sixth 5-year plan, the bureau completed a total of 991 scientific research projects, of which 551 have been disseminated. The Shanghai Machine Tool Research Institute, the Instrument and meter machine tool plant, the No 12 machine tool plant jointly conducted a "research on the technology of the modularity of small instrument and meter machine tools" and achieved fairly good results. They can use 54 basic modules to form 202 different kinds of products. These modules plus 45 functional modules can satisfy a variety of demands. They are at the leading level of the industry at home.

5. Vigorous technological innovation and activities to solve key technological problems to speed up enterprises' technological transformation. The bureau completed 1,150 research projects to solve key technological problems, of which 750 have been disseminated. The bureau also completed 38,587 projects on mass technological innovation, accounting for 20 percent of all mass technological innovation projects completed in Shanghai Municipality.

6. Strengthened construction of scientific research bases which have begun to take shape. During the sixth 5-year plan, the bureau consolidated 16 research institutes subordinated to bureaus or corporations, increasing their S&T personnel by 39.2 percent and fixed assets by 82.8 percent.

7. Attending to the training of S&T personnel and expanded the contingent of S&T personnel of the bureau. At present, the bureau has 30,000 engineers and technicians, an increase of 63.7 percent over 1980. Among them, many middle-aged and young S&T personnel have been assigned to leading positions at all levels.

8. Acceleration of S&T progress and effectively promoted production and the improvement of economic results. In 1985 the output value of the "seven categories of products" reflecting the technological progress of the bureau (the first batch of new products in production, renovated and updated products, products using international standards, imported and assimilated products, good-quality products, energy-saving products, and large key products) totalled 2.63 billion yuan, accounting for 36.3 percent of the total industrial output value of the bureau. During the entire sixth 5-year plan, except for the first year when readjustement was carried out, the total output value increased on an average of 11 percent annually and the profits increased on an average of 13 percent annually in the last 4 years.

Shanghai's machine-building and electronics industries are advancing, improving, and developing, but we should notice that the current situation of Shanghai's machine-building and electronics industries still cannot satisfy the needs of the development of various sectors of the national economy and lag far behind the fast-growing machine-building industry in other countries. Even when compared with neighboring provinces and municipalities, the original advantages of Shanghai's machine-building and electronics industries are also diminishing and some have become disadvantages. This can be seen from the following three aspects:

1. From the wave of the "new technological revolution" currently surging in the world.

The worldwide wave of the "new technological revolution" has effectively accelerated the development of the machine-building industry. Drastic changes have taken place in the machine-building industry abroad in regard to production structure, product mix, the means of production, organizational management, and personnel development. Their main expressions are:

Machine-building, electronic and test technologies are combined to develop a large number of new products that integrate machines, electronics, and instruments, raising traditional mechanical products to a new level. For instance, large, complete sets of equipment consisting of products of new generation and controlled by advanced computers have realized the optimized control of production process.

New technologies are used to transform the technology of the machine-building industry, enabling mass-production plants to alternate production of a variety of products and plants of medium and small capacity to be automated, resulting in the high efficiency, quality, precision, and flexibility of the production of machine-building enterprises.

The development and application of new technology has turned the machine-building industry into a technology-intensive industry; the development and application of new materials has helped develop new products and improve the product mix.

The dissemination and application of computer-assisted design, testing, manufacturing, and management and modern management methods such as system engineering have helped realize the modernization of scientific research, designing, and administration and management, thereby substantially increasing the development ability and adaptability of enterprises.

In sum, the wave of new technological revolution has resulted in rapid development in the machine-building industry abroad. This is a severe challenge to Shanghai's machine-building and electronics industries. Will we catch up with others in a timely manner or fall behind, farther and farther away from others? This needs to be answered with our real action.

2. From the gap between ours and foreign machine-building industries

Along with the development of the machine-building industry abroad, the gap between Shanghai's and foreign machine-building industries is getting wider and wider. Our prominent problems are poor quality, limited variety, low level, and poor economic results. Their concrete expressions are as follows:

In regard to quality: Many products of Shanghai's machine-building and electronics industries still cannot meet all of the standards set by the state and the ministry in regard to quality indexes such as performance, reliability, durability, and precision; whereas the majority of the existing 4,857 standards set by the state and the ministry are lower than corresponding international standards.

In regard to variety: In the 1970's, the Soviet Union had about 240,000 varieties of mechanical and electronic products and the United States had 600,000 to 700,000. Compared to them, China had only 50,000 whereas Shanghai's machine-building and electronics departments had only 12,000, far from being able to satisfy the needs of the development of major state engineering projects. For instance, of the mechanical and electronic equipment, products, and accessories demanded by the Baoshan Iron and Steel Complex, the varieties we are able to provide account for less than 20 percent.

In regard to the level of products: Of the 12,000 varieties, only 65 percent are equivalent to the 1950's and 1960's levels in foreign countries. Besides, product mix is extremely backward. There are many labor-intensive products and few technology-intensive ones. Of 124 varieties of metal cutting machine tools, ordinary lathes account for 32 percent and ordinary drilling and shaping machines account for 32 percent whereas precision and numerically controlled machine tools account for only 8.7 percent. The automation level of large complete sets of equipment is low and their capacity is 1 to 2 grades lower than that of foreign countries. The average single-unit efficiency of general machinery is 5 to 10 percent lower than the advanced level of foreign countries and the designed heat efficiency of industrial boilers is 8 to 10 percent lower than that of similar products in foreign countries. The level of manufacturing technology is even lower. The utilization rate of materials is 10 percent and more lower than that of foreign countries and energy consumption is 50 percent and more higher. Because of this, the whole level is 20 to 25 years behind other countries.

In regard to economic results: The labor productivity of the whole staff of Shanghai's machine-building and electronics departments has long hovered about 20,000 yuan whereas that of the United States is $65,000, that of the Federal Republic of Germany is $60,000, and that of Japan is $57,000. Ours is equivalent only to one-sixth to one-seventh of theirs.

3. From the comparison between us and the counterparts of neighboring provinces and municipalities at home.

In the past few years, some enterprises of Shanghai's machine-building and electronics industries have lagged behind when compared to foreign enterprises. And the advantages they originally had in science and technology are also diminishing and some have become disadvantages when compared to their counterparts at home. Now some people think that it is possible for Shanghai to become the champion of a "team competition," but it is very difficult for Shanghai to become the champion of an "individual competition"--namely, the comparison of specific products. Take high-pressure switches for example. Shanghai's products occupied a leading position in the 1960's and lost the advantage in the 1970's. Take water pumps for another example. General-purpose cast iron pumps still account for the majority of such products in Shanghai and special-purpose pumps account for only 16 percent whereas in the Shenyang Water Pump plant, the output of special-purpose pumps accounts for over 60 percent. This problem is even more prominent in the machine tool business. The proportion of precision and numerically controlled machine tools is relatively small in Shanghai whereas numerically controlled machine tool processing centers are cropping up in Kunming, Chongqing, Shenyang, and Dalian. The Qinghai No 1 Machine Tool Plant has completed the designing and development of a whole series of vertical processing centers with an annual production capacity of 10 to 20 sets. This plant is now speeding up the development of horizontal processing centers. In comparison, Shanghai's machine tool industry is behind.

Due to the loss of S&T advantages, the improvement of the economic results of Shanghai's machine-building and electronics industries has also been affected. According to the comparison between the economic results of the machine tool industry in Shanghai and other parts of China, Shanghai has an advantage over others in absolute value but lags behind in relative increase rate.

The host of facts stated above have shown that Shanghai's machine-building and electronics industries are facing two pressures, domestic and international, which are getting heavier and heavier with each passing day. Because of this, we must fully understand the importance and urgency of accelerating S&T progress and be fully determined to speed up S&T progress.

II.

The Orientation and Task of S&T development for Shanghai's Machine-building and Electronics Industries During the Seventh 5-year Plan

The period of the seventh 5-year plan is an extremely important one for China's economic development. And with the continuous surging of the wave of the worldwide new technological revolution, it poses as an opportunity as well as a challenge to Shanghai's machine-building and electronics industries. To face the challenge of the new technological revolution, the guiding ideology of S&T development for Shanghai's machine-building and electronics industries during the seventh 5-year plan should be to seize the opportune moment currently available abroad and use the results of new technological revolution to revamp traditional industries as soon as possible, focus on the

establishment of fledgeling industries, strive to bring about a growth rate that is higher than "the previous period," provide for all sectors of the national economy mechanical products that have the 1970's and the early 1980's levels of industrially developed countries so as to satisfy the needs of these sectors in technological transformation and in earning foreign exchange through the expansion of exports.

The goals of S&T development for Shanghai's machine-building and electronics industries during the seventh 5-year plan are to "aim at advanced international levels, focus on 2 markets, fight bitterly for 5 years, pledge to fulfill 4,000 targets, and vie to become the national vanguards of the machine-building industry." "Pledging to fulfill 4,000 targets" means: By 1990, Shanghai's machine-building and electronics industries should have 250 leading products (basic series), the technological level of 3,000 major products should basically reach the 1970's and the early 1980's levels of industrially developed countries, 500 projects should be carried out to solve major technological problems, 100 model plants and units of technological transformation should be established, and 150 products integrating machinery, electronics, and test instruments should be developed.

To achieve the above goals, the main tasks of the S&T development of Shanghai's machine-building and electronics industries should be as follows:

1. Speed up their own technological transformation and focus on the transformation of 10 large industries.

In order to provide technical equipment of advanced levels to various sectors of the national economy, during the seventh 5-year plan, Shanghai's machine-building and electronics industries should vigorously use new technology to step up their own technological transformation with emphasis on 10 large industries.

A. The generator industry. According to state's demand that Shanghai concentrate on developing thermal and nuclear power equipment, it is necessary to speed up the development of large generator sets and gradually eliminate medium-sized and small generator sets. With regard to thermal power equipment, the task for the near future is to do a good job in the technological assimilation and application of the 300,000 kilowatt-generator set imported from the U.S. Westinghouse Co., revamp three major power plants, and improve the batch-production capacity of 300,000 kilowatt-generator sets. On this basis, efforts should be made to develop 600,000-kilowatt thermal generator sets. With regard to nuclear power, the research and development of 600,000 kilowatt-generator sets should be carried out on the basis of doing a good job in the development of 300,000 kilowatt-generator sets.

B. High-tension power transmission and transformer industries. During the seventh 5-year plan, Shanghai should first assimilate the imported BBC10-35kW urban power transmission and transforming equipment and the 110-220kV complete set of power transmission and transforming devices, form mass-production capacity, and gradually develop 500kV products.

C. The Auto industry. The Shanghai auto industry should use (Sentana) sedan, which is jointly manufactured by China and Germany, as a basis, and gradually speed up the process of making all spare parts Chinese through assimilation and application. During the seventh 5-year plan, it should form an annual production capacity of 30,000 vehicles. According to the arrangements of the Ministry of Machine-building Industry, Shanghai should develop the technology imported from the U.S. WABCO Co. to produce 35-ton mining cars and the Honda technology imported from Japan to produce medium- and heavy-weight motorcycles.

D. The tractor and internal-combustion engine industries. Shanghai should use the Italian government's loan to import the technology of the Fiat Co. to develop 40-65 horsepower paddy field wheeled tractor and transform Shanghai's Model 50 tractor. With regard to internal-combustion engines, in addition to importing the technology of (Sentana) engine, Shanghai should import and develop the technology of medium-horsepower diesel engines for use in construction machines and use it to raise the technological level of Model 680, 95, and 135 series of engines.

E. The machine tool industry. During the seventh 5-year plan, Shanghai's machine tool industry should use World Bank's loans to strengthen technological transformation, concentrate on developing mould processing machine tools, high-efficiency precision press machines, and precision grinding machines and measuring instruments. By the end of 1990, 80 percent of products should reach the late 1970's and the early 1980's international levels. Of which, precision, high-efficiency, numerically controlled processing centers should account for 40 percent.

F. The construction machinery industry. It is necessary to combine imports with development focusing on bulldozers, hydraulic excavators, diesel pile drivers, and vibrating road rollers and provide corresponding construction machinery for the construction of tall buildings such as tower cranes, elevators, concrete mixers, and mortar pumps.

G. The light industrial machinery industry. It is necessary to focus development on printing, food packaging, and plastic machinery. The development of food machinery should give priority to convenient foodstuff and dairy goods processing machines; the development of printing machines should emphasize double-sided and offset presses and gradually develop serial products. Plastic machinery should combine imports with the development of plastic pouring and injecting machines.

H. The air conditioner, compressor, ventilator, and industrial pump industries. The focus is to develop high-efficiency cabinet-style air conditioners, self-contained air conditioners, and automated-control components; spiral compressors, sliding-vane compressors, and non-oil lubricating compressors; large axial-flow ventilators and variable, low-noise air conditioner ventilators; and pumps for ships and power stations and corrosion-resistant and through-flow pumps.

I. The component industry. Efforts should be focused on the product renewal of low-voltage electric appliances, bearings, and hydraulic pneumatic elements. Low-voltage electric appliances and hydraulic and pneumatic elements should rely mainly on the assimilation of imported technology and adopt international standards to gradually develop products that have Chinese characteristics, an advanced structure, and higher technological and performance indexes. By the year of 1990, the bearing industry should make the quality (including precision, performance, and life) of general bearings, which are produced in large numbers and used widely, and major specialized bearings near or reach the late 1970's and the early 1980's level of the Sweden SKF Co.

J. Basic technologies. We should emphatically develop and carry out the mass production of multi-process machine tools and automated assembly lines; produce in moderate and small numbers of numerically controlled machine tools, multi-axis adjustable power heads, adjustable main shaft boxes, and processing center machine tools; and use them in key areas. As far as casting technology is concerned, we should carry out research on the optimization of metal, raw, and supplementary materials, smelting and moulding techniques, and machine-building and spread the use of microprocessors in production processes. Forging technology should focus on the development of drop-forging and precision forging and the improvement of forged products and the degree of mechanization of forging. Heat treatment should focus on the development of controlled-environment and induction-heating heat treatment and gradually develop vacuum heat treatment. As far as welding technology is concerned, we should popularize high-efficiency welding technology based on the CO_2 protective welding, numerically controlled and photoelectric track cutting, develop the welding rods, wires, and flux that could upgrade welding automation, and adopt steel plate pretreatment technology.

2. Speed up the development and application of new technology and develop fledgeling industries and products.

The focus is in the following six areas:

A. Products integrating machinery, electronics, and instruments. Efforts should be made to popularize the development and application of microprocessors in regard to 20 major categories and 150 varieties of products including power stations, automobiles, machine tools, electric furnaces, and industrial boilers and strengthen the development of key components and systematic installation such as special-purpose integrated-circuit components, sensor elements, industrial control systems, and automated devices.

B. Industrial robots. It is necessary to develop key projects, starting with the demonstration application of industrial robots in the areas of spray painting and welding in pilot units.

C. The application of laser technology. Laser technology should be developed and applied first in the areas of welding, cutting, heat treatment, surface treatment, measurment, dynamic balance, mechnical vibration, intensity analysis, and non-destructive inspection.

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D. The research and development of new energy equipment. For instance, as far as power generating equipment is concerned, efforts should be made to study supercritical thermal power generating equipment and technology, the development and utilization of medium- and low-temperature cascades of thermal power generators, nuclear power generating, and high-energy batteries.

In addition, there is also the development and application of optical fiber, photon bunch, accelerator, and irradiation technologies.

3. Emphasize the focal points of scientific research and vigorously carry out research on basic technology.

Backward basic technology is one of the important reasons for the low level of China's mechanical products whereas the development of mechanical products toward high parameters has set forth new demands on basic technology; therefore, we must vigorously strengthen research on basic technology and accelerate the development of basic technology. During the seventh 5-year plan, we should emphatically carry out research on the following basic technologies:

Research on design theory and methods. We should continue to carry out research on mechanical intensity, fatigue, fracture, and axial oscillation, the dynamic characteristics of complex structures, and man-machine systems; and study and popularize the application of value engineering, industrial model design, optimized design, and system design. We should determine and collect the load diagrams of the key products, major serial products, and crucial basic components of large, complete sets of equipment under normal working conditions and experiment with and accumulate the numerical value of material performance and design coefficients. We should use 7 years or so to establish design procedures, standards and technical data bases for major products and typical spare parts and components and realize the modernization of design.

Research on energy-saving technology. We should carry out research on the coal combustion technology of boilers and industrial furnaces, fluidized-bed combustion and fluidized gasification technologies; the new-style low-fuel consumption and low-pollution combustion system of internal combustion engines, supercharger technology, heat insulation technology, and substitute fuel combustion technology. We should carry out applied research on ternary flow theory, two-phase flow theory, hydraulic models, and the theory of mechanical erosion and improve the product design of pump, ventilator and compressor to improve efficiency. We should carry out research on supercritical boiler combustion of power stations; the heat transmission and dynamic characteristics of two-phase flow; and the aerodynamics, two-phase flow, and water percussion and vibration of large turbines to provide bases for increasing heat efficiency and reliability.

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Research on reliability and failure analysis. We should carry out research on the technology of product reliability design method and the distribution, appraisal, forecasting, and analysis of reliability indexes. We should establish a product quality feedback system, conduct spare part and material failure analysis, accumulate reliability data, and establish a failure case center.

Research on the environmental technology of mechnical and electronic products. We should carry out in-depth research on the environmental conditions and environmental experiment method of mechanical and electronic products, environmental experiment, testing instruments, and the technology of protecting mechanical and electronic products used in special environment.

At the same time, during the seventh 5-year plan, Shanghai's machine-building and electronics industries should also conduct research on such basic technologies as friction, abrasion, lubrication, sealing, materials application, corrosion and surface protection, blank refining, moulding, large-scale manufacturing, precision and super-precision processing, testing, and automation.

4. Study management technology and raise the level of scientific management.

Management technology plays an important role in S&T development, and it determines to a certain degree how fast science and technology are transformed into productive forces. Therefore, we must make great efforts to do research on management technology. During the seventh 5-year plan, in light of the reality of Shanghai's machine-building and electronics industries and in accordance with needs, we should study and popularize modern management methods such as systems engineering, network technology, input-output analysis, forecasting technology, policy decision analysis, value analysis, technological economic analysis, evaluation methods, target management, market research, and all-around quality control so as to raise the S&T and enterprise management levels of Shanghai's machine-building and electronics industries.

III. Develop Horizontal S&T Links To Promote the Revitalization of Shanghai's Machine-building and Electronics Industries

The S&T development plan of Shanghai's machine-building and electronics industries for the seventh 5-year plan is a fairly large systems engineering project with very arduous tasks. It not only needs to mobilize the broad masses of engineers, technicians, staff members and workers of Shanghai's machine-building and electronics industries but also needs to gain the support and assistance of the S&T departments of the central government and neighboring provinces and municipalities. Because of this, developing horizontal S&T ties is also an important link of revitalizing Shanghai's machine-building and electronics industries.

1. Carry out international S&T exchanges. We should start with the sister cities which have already had friendly relationship with Shanghai and establish exchange relations with relevant S&T organizations. In accordance with the development needs of Shanghai's machine-building and electronics industries, we should draw up plans and goals to "invite people in" or "send

people out" so as to keep abreast of the trends and information of international S&T development in a timely manner and carry out international joint development and cooperative design and manufacturing in key projects.

2. Develop ties with institutions of higher education and scientific research units. The institutions of higher education and scientific research units are the main force of S&T progress. They have abundant S&T forces, complete experimental conditions, and large amounts of S&T information. During the sixth 5-year plan, Shanghai's machine-building and electronics industries associated with over 100 institutions of higher education and scientific research units across the nation and achieved marked results. From now on, we should further develop horizontal ties in this regard. Institutions of higher education and scientific research units are welcomed to develop various kinds of horizontal S&T and economic ties with the machine-building and electronics industries. Shanghai's machine-building and electronics industries are willing to provide everybody with different ideas of association.

3. Strengthen ties with S&T and academic organizations in all areas. S&T and academic organizations in all areas have a galaxy of talents, assorted departments, and advantages over horizontal ties. The Shanghai Society of Mechanical Engineering is expecting to associate with S&T and academic organzations in all areas to help and coordinate with each other, be each other's backing, and work together to promote the revitalization of Shanghai's machine-building and electronics industries and all industries in other areas.

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ZHEJIANG UNIVERSITY STUDENT SCIENCE ASSOCIATION DISCUSSED

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[Article by Li Hongbing [2621 3126 0393]: "They and Society Are Looking at Each Other; on the Student Scientific and Technological Association of the Zhejiang University"]

[Text] Student organizations which used to be very active in institutions of higher education went downhill in recent years. While people were shaking their heads at young people's "5-minute enthusiasm," the Student S&T Association of the Zhejiang University, to our surprise, came out of obscurity and set the world on fire.

The "instrument for testing the physical and chemical compatibility of 104 kinds of injections" which they developed for medical use passed provincial-level technical inspection.

Entrusted by the Hangzhou City S&T Association, they contracted for the organizational and management work of all technical training in the Xihu District...

Walking onto the campus of the Zhejiang University, you would see a notice on a schoolwide English contest, a notice on radio technology lecture, and on the maintenance and repairs of household electric applicances, and an announcement on the opening of a sewing club...All of the above have an eye-catching signature--the Student S&T Association of the Zhejiang University.

Student S&T Association Should be Surnamed "Science"

On 24 March 1984, at a long abandoned old shower room, which looked brand-new after painstaking cleaning, the founding of the student S&T association was announced. In merely several months, it attracted over 1,100 members and had 6 direct branches and 16 departmental branches. The total number of its memberships was the highest among all student organizations on the campus. Last fall, peddling sounds were heard on the scholastic campus of the Zhejiang University and now and then students wearing glasses could be seen doing business at street stands on the boulevard.

The student S&T association, which was in its initial stage, thought that it was a short cut to the work-study program. So, the members of the student S&T association managed to join street peddlers and peddled the colorful musical new year cards they bought at wholesale prices to their fellow students...The original intention of the student S&T association--"base on S&T activities and promote the training of talented people"--was forgotton.

The student S&T association, which once created a furor, became lonely at the Zhejiang University.

Lin Jiang [2651 3068], vice chairman of the student S&T association, thought that it seems to be a final conclusion that Chinese college students are strong in theory but weak in ability. Because of this, the Zhejiang University was jokingly called "The University of only talk" (homonymous in Hangzhou dialect). The original purpose in running student S&T association is to change student's tendency of ignoring practice, carry out extracurricular activities in regard to science and technology to serve as a work-study program, and cultivate their actual working and organizing abilities and their ability to engage in social activities. But, they were making a profit because of the price disparity between wholesale and retail prices. What did it have to do with ability training and S&T activities? At the end of last year, Lin Jiang became the new chairman of the student S&T association. As soon as he took over, supported by the department of teaching practice of the university, he made several merciless decisions:

Stop meaningless commercial activities, abolish several subordinate "centers" and "companies" which failed to play a significant role, add a scientific research and a vocational training departments, consider scientific research as the central task and use it to promote other work. The S&T association should be surnamed "science" not "commerce." This is very clear.

Remove cadres of the S&T association who failed to do their job, were irresponsible, and had poor grades. Newly assigned cadres must have an average grade of over 75 so that they could carry out the activities of the second classroom on the basis of doing a good job in the first classroom...

Since the winter vacation of this year, the Student S&T Association of the Zhejiang University has carried out their work in an orderly manner, scored a series of scientific research achievements, and began to show off their abilities to the school and society.

Extending Their Feelers to the Corners of Society

In the plain shabby office of the student S&T association, a large red poster with bold black letters was hung on the wall. It reads: "The Spark Plan of S&T Work for 1986." The students said: "We also want to help the poor with science and technology."

The student S&T association managed to look beyond the tall wall of the campus and toward society and countryside. They cooperated with the Cixi County Fishing Gear Plant of Ningbo City, carried out their first project--infinite speed regulator--and made a profit of 300 yuan. This small success boosted

their confidence. They began to make direct contacts with factories, concentrating on those commune-run factories and township and town enterprises in rural areas which are small with a weak technological foundation to solicit projects on small inventions, technical training, and the understanding of machinery through pictures for young factory workers with the factories providing funds and the association providing technology. These "little technicians" brought energies to the factories and made the association a little famous. When a contract was pending on the "compatibility instrument," five or six counties were competiting with each other to cooperate with the association.

The student S&T association has an external relation department which carefully collects all kinds of information and promptly reflects them to the presidium. Before the project on the "compatibility instrument" was started, they investigated all kinds of hospitals in Hangzhou City, provided reliable information on the consumption demand of medical personnel and the purchasing power of medium-sized and small hospitals, and laid a solid foundation for the success of the development of the "compatibility instrument." On 29 April, 1985, many experts and scholars attended the technical inspection of the "compatibility instrument" which was sponsored by the provincial pharmaceutical company. They whispered to each other: "I have attended many inspections, but attending the inspection of students' achievement is a first for me." Nervous students finally got an inspection certificate which says: Its design is logical, its technology is advanced, and it belongs to the advanced level of similar products in China.

In March 1986, the State S&T Association and the Ministry of Commerce jointly issued a notice, urging all S&T associations which have conditions to strive to change the situation in which maintenance and repair services are hard to get for household electric appliances. Consequently, the agenda of the Student S&T Association of the Zhejiang University became busy again. After a preparation period, the "Zhejiang Radio and TV Weekly" ran an ad on a training class for the maintenance and repairs of refrigerators, electric fans, washing machines, and recorders sponsored by the student S&T association during summer vacation. The school gave them some surplus equipment and spare parts for household electric appliances and offered room and board to students enrolled in the training class.

A graduate wrote a letter, saying: Limited activities of the S&T association have helped him develop abilities which cannot be learned from books and reduced the difference between college students and real work they face after graduation. Lin Jiang who is going to leave his post also said: "I think three things are positive about students engaging in scientific research. One is applying their professional knowledge to real work and cultivating different abilities. Second is serving society. Third is finding a channel for the work-study program."

The Student S&T Association of the Zhejiang University is already two and one-half years old. They are now beginning to train the new members of the 84th and 85th classes. They are thinking about how to send science and technology to the mountainous areas of Zhejiang Province. They are looking into the future.

BRIEFS

TITANIUM WHITE PRODUCTION REPORTED--The good news has come from Xiamen, a coastal city in the southeast, that this country can produce what is held throughout the world to be the whitest thing--chlorinated titanium white, and the intermediate tested technology for producing 1,000 tons of chlorinated titanium white per year passed its ministerial evaluation in Xiamen on 6 December. Titanium white is the best material for the white color, and one gram of titanium white can paint several hundred square centimeters snow white. It is strongly adhesive, durable and economical, safe and non-poisonous, and may be broadly used in the industries of coatings, plastics, papermaking, chemical fibers, and rubber. In the past in this country, we could only produce titanium white with sulphuric acid, where the quantities were small and the quality deficient. Under the coordinated support of the Xiamen Electrochemical Plant, the Institute of Coatings Research of the Ministry of Chemical Industries, the 3d Design Academy of Ministry of Chemical Industries at the Dongbei Academy of Engineering, and the Shanghai Silicate Institute, all of which assumed responsibilities for this major national science and technology problem solving project, after 8 years of effort they finally worked their way through the entire technological process for producing titanium white through chlorination. The product quality is of the standard of similar foreign products. [Text] [Beijing GUANGMING RIBAO in Chinese 10 Dec 86 p 1] 12586

NEW MICROPROCESSOR--Beijing, 10 Oct (XINHUA)--After 3 years of effort, the Microelectronics Institute of the Qinghua University has successfully developed a 8086 3-micron HMOS 16-bit microprocessor, which passed ministerial level assessment tests today. This new microprocessor has a very strong command system and searching ability, and can be applied extensively to such categories as scientific computation, program control, intelligent terminal, and communication systems. The State Educational Commission took charge at today's assessment meeting. [Summary] [Beijing XINHUA Domestic Service in Chinese 1245 GMT 10 Oct 86 OW] /9738

SHENYANG TO PIONEER S&T REFORMS--Beijing, 6 Feb (XINHUA)--The State Council has asked Shenyang to pioneer the current reforms in China's science and technology system, city officials told XINHUA today. The city, capital of Liaoning Province, has over the past few years experimented with ways of restructuring the urban economy along with other major cities including Wuhan and Chongqing. Reforms in science and technology work planned by the city government include setting up agencies for developing new technology, instituting on a trial basis a responsibility system for the management of research, and experimenting with the work to contract out research projects. [Text] [Beijing XINHUA in English 0921 GMT 6 Feb 87] /9604

MACHINE TOOL EXPORTS TO HUNGARY REPORTED--The machining center machine tools manufactured by the Dahe Machine Tool Plant have been well received in Hungary. In April of this year [1986], 4 vertical machining center machine tools of the Dahe Machine Tool Plant settled into place in a large factory in Budapest, Hungary. Because this kind of machine tool uses an advanced numeric control system and has implemented both international standard cutting tools and the original cutting tools of the Hungarian firm, it is advanced, standard, and of reasonable construction. The Hungarian factory allowed inspection of the work machined by this machine tool, and after responsible persons from many factories in the Budapest area had inspected and learned from this, there was endless praise for the Chinese Dahe machine tools. [Text] [Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 27 Nov 86 p 3] 12586

SCIENCE RESEARCH GUIDE--Beijing, 8 Feb (XINHUA)--The State Natural Science Foundation has decided to issue a "Guide to Natural Science Foundation Projects" annually, beginning this year, for the purpose of giving guidance to scientists in selecting research projects and avoiding duplication of efforts. The 1987 Guide consists of three parts: areas of research eligible for application for assistance from the foundation; areas of research for which scientists are encouraged to apply for assistance; and specific research projects reflecting the trend of science development and meeting the needs of China's national construction and development of science. The fields covered by the Guide include mathematics, physics, chemistry, biology, earth science, materials science, engineering science, information science, and management science. [Summary] [Beijing XINHUA Domestic Service in Chinese 0232 GMT 8 Feb 87] /9604

CSO: 4008/2069

PHYSICAL SCIENCES

ELEMENTAL ANALYSIS UTILIZING TRANSIENT GAMMA-RAY AND CHARGED PARTICLES INDUCED BY THERMAL NEUTRONS

[Article by Shi Zongren [4258 1350 0088], Chinese Academy of Nuclear Energy Science]

[Abstract] When thermal neutrons captured by nucleus undergo de-excitation, gamma rays are emitted with energy from hundreds of keV to 8 MeV. A particular nucleus can emit particular gamma rays. This analytical method is called analysis of transient gamma-rays induced by thermal neutrons, or transient gamma analysis, for short. There are two important parameters in the analysis: (1) the theoretical sensitivity (which determines the measurability of various elements) and (2) minimum mass (or minimum measurability) of the measurable element. The latter is not only related to theoretical sensitivity, but also to neutron flux, detection efficiencly, sample components, and ambient environment. The experimental arrangement consists of four sections: a neutron source, sample, gamma ray detector, and an electronic instrument and data-capture system. Two tables list the minimum measurable limits of various elements, and elements and sensitivities used in thermal neutron measurement. Five figures show a transient gamma analysis arrangement, its analytical arrangements inside and outside of a target, measurement of elemental depth distribution, experimental results, and definition and practical significance of the FWHM (Full Width at Half Maximum) values. The author is grateful to colleagues Sun Hancheng [1327 3352 1004] and Xing Jinqiang [6717 6651 1730] for their supports and assistances.

WHY IS CP VIOLATION VERY SMALL IN THE STANDARD MODEL OF ELECTROWEAK THEORY?

[English abstract of article by Wu Dandi [0702 0030 6611] of the Institute of High Energy Physics, Chinese Academy of Sciences]

[Text] By using the nontrivial rephasing invariants $\Delta_{i\alpha}$ of the KM matrix, all the factors which suppress CP violation effects in the standard model with three generations are discussed. They are: Im $\Delta_{i\alpha}/\gamma$ (KM), the unevenness in magnitudes of two quantities whose weak phases are going to be compared, the effects of strong phases, etc. The arguments are supported by examples.

CSO: 4009/18

PHYSICAL SCIENCES

EFFECTIVE INTERMEDIATE RANGE INTERACTION IN BARYON SPECTROSCOPY AND ITS EFFECT ON N-N INTERACTION

[English abstract of article by Hu Bingquan [5170 3521 0356], et al., of the Institute of Nuclear Science and Technology, Sichuan University; Zhang Zhaoxi [1728 5128 6007], et al., of the Institute of Theoretical Physics, Chinese Academy of Sciences]

[Text] In this paper we introduce the phenomenological quark-quark intermediate range potential to fit the non-strange baryonic spectrum with $N \leq 2$ on the basis of the model of one-gluon exchange with a confining potential. It is shown that the calculated position of the resonances below 2 GeV can be in good agreement with the experiments by taking an appropriate quark-quark intermediate range potential. The N-N interaction is also investigated with this new phenomenological potential.

CSO: 4009/18

ANALYSIS OF PRIMARY COSMIC RAY COMPOSITION AT ENERGIES AROUND 10^{14}eV USING SINGLE-SHOWER EVENTS OBSERVED BY MOUNTAIN EMULSION CHAMBER

[English abstract of article by He Yudong [0735 3558 2639], et al., of the Institute of Physics, Yunnan University; Ding Linkai [0002 2651 1956], et al., of the Institute of High Energy Physics, Chinese Academy of Sciences]

[Text] The characteristics of electromagnetic and hadronic components in high energy cosmic rays at mountain altitude are studied by analyzing single-shower events observed by a mountain emulsion chamber. The chemical composition of primary cosmic rays in the energy region around 10^{14} eV is studied by using Monte-Carlo simulation. The simulated power indices of energy spectra and attenuation lengths in air are in agreement with the experimental data. The analysis of their vertical intensities indicates that the chemical composition of primary cosmic rays at energies around 10^{14} eV is not contradicted to the simple extrapolation from lower energies and the abundance of protons cannot be less than 30 percent, while that of the nuclei with $A \geq 2$ cannot be larger than 70 percent.

CSO: 4009/18

SPATIAL DISTRIBUTION OF MAGNETIC FIELD EXPRESSED BY FIELD ON MERIDIANAL PLANE

[English abstract of article by Li Zenghai [2621 1073 3189], et al., of the Institute of Atomic Energy]

[Text] A general expansion in the Taylor series of the space magnetic field (median plane symmetry or nonsymmetry) expressed in terms of the field in the $\phi=\phi_0$ meridian plane, which may be expressed analytically or by field values at discrete nodes, is derived in a cylindrical coordinate system.

9717
CSO: 4009/18

APPLIED SCIENCES

ATOMIC ENERGY AGENCY'S HEAVY WATER REACTOR DESCRIBED

Beijing GUANGMING RIBAO in Chinese 19 Sep 86 p 2

[Article by Liu Jingzhi [0491 2417 2535]]

[Text] In the vicinity of Liang Xiang, Fangshan County, 30 kilometers from
Beijing, there sits a heavy water research reactor which has been operating
safely for 28 years. It was first built in 1958, underwent modification in
1978, and is now under the shade of green trees, a permanent neighbor of the
national capital.

"Once the word nuclear is mentioned, a feeling of dread emerges in many; it
seems that things nuclear can only bring death to mankind, an unfair
standpoint. In fact, the manufacture of nuclear weapons is only part of
nuclear energy utilization and its greater use is for peace and for the
benefit of mankind. Some predict that it is very possible that after the
exhaustion of coal and oil resources, it will become the most important energy
resource on earth," Comrade Ma Fengzao of the Chinese Nuclear Research
Institute said to me during my visit. "For example, this reactor of ours, in
the past 28 years, has done numerous good things for the people. It has
provided more than 80 different kinds of radioactive isotopes for more than
1,000 hospitals; it has made unique contributions in microelectronic
technology; some non-qualified silicon chips will become high performance
qualified ones after radiation with by the reactor. In addition, it can help
public security personnel to crack criminal cases. For example, not long ago,
it was with our mini-reactor that helped solve an important murder case
through the analyses of hair."

"Is this reactor the same as those used in power plants?" I asked.

"They are the same in theory, the difference being that the energy produced by
a nuclear power plant is used for electricity generation; therefore, an
electricity generation system is added. As for the radioactivity, there is no
difference."

By then, our car had entered the reactor area and we could see the high
cooling tower.

I thought that there would be little grass or trees in the vicinity of the reactor, yet to my surprise, green crops were all around.

"Every year we inspect and check the vegetables and grains grown here, and we have never found anything unusual. Look, those green vegetables outside the wall are for our people to eat." Ma seemed to have detected my puzzlement, and explained on his own initiative.

I finally approached the reactor. It is a cylindrical building and is about three stories high.

"Don't be impressed by the hugeness of the building; the place where the nuclear reaction takes place is less than a cubic meter! And there is heavy water all around it," Xia Yanling, the engineer who accompanied me at the reactor, explained.

I was there during a day when the reactor was shut down for inspection and I was fortunate enough to enter the big hall, which was normally closed, and I climbed to the top of the reactor and observed the cylindrical core, less than a cubic meter, from the opening.

"Reactors are differentiated according to the modulating material, such as graphite, heavy water, or light water. The one used in Chernobyl, Russia is graphite modulated. Carbon is the composition element of graphite, which is combustible and may end up in disaster. The reactors in China all apply advanced pressurized-water technology, with its smaller size and greater safety factor. In addition, there is a safety shield so even if an accident happens, its pollution will not be able to leak out of the shield," Xia explained in detail.

I interviewed several engineering and technical personnel who explained carefully the reasons why this reactor has been in operation safely in the past 20-odd years: first, technical requirements of our country for nuclear safety are set at a higher standard with a greater safety factor and automatic alarm and shutdown equipment. Second, there is a complete set of operating systems and regulations to provide safety. Third, there is a group of operators with higher levels of training and a strict training system has been established to avoid errors by operators of inferior quality.

The specialists told this reporter that there is no direct connection between the reactor's safety and its output. It is a misunderstanding to think that the larger the output of a reactor is, the larger the possibility of having an accident.

At present, there are many countries who own nuclear power plants. Even in the province of Taiwan, nuclear generated power represents 59 percent of its total power generation. Now we already have a more complete and advanced industrial system and safe nuclear power, therefore, we have full confidence in the good construction, management, and utilization of nuclear power plants.

12909/9599
CSO: 4008/8

APPLIED SCIENCES

CHINA PRODUCES WORLD CLASS SOLAR BATTERIES

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 22 Aug 86 p 3

[Report: "China Now Producing 'World Class' Solar Batteries"]

[Text] XINHUA, Beijing: China has made considerable achievements in the research and manufacture of solar batteries for use in space and the performance of the product has reached international standards; the research and manufacture work in ground use solar batteries has also made rapid progress. Two-Watt to 20-Watt solar battery assemblies can be mass-produced and the newer type low-cost assemblies are under research.

Photovoltaic technology is one of the methods used by man to utilize solar energy. The solar battery is the product of research and application of this technology. Owing to its many merits of flexibility, long life, non-pollution, and noiselessness, the solar battery is internationally recognized as one of the promising new energy sources.

In the early seventies, China successfully used locally manufactured solar batteries in the self-designed and manufactured scientific experimental satellite. The 20 x 40 mm^2 single crystal silicon space solar battery has been tested in the U.S. space shuttle and results show that its performance has reached world class.

Since the world energy crisis in the mid-seventies, the application of the solar battery has turned from space to earth. Today, there are more than 40 institutes, universities, and plants in China which research and manufacture solar batteries, and the types and performance of some of the ground solar batteries so far produced have approached international standards. The initial cost of solar batteries has been greatly reduced and they are now being used in beacon lights, railroad signals, electrified fences, black light, and microwave relay stations, representing a total power of 180 kilowatts.

12909/9599
CSO: 4008/8

APPLIED SCIENCES

CHINESE-MADE F-7M DETAILED

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 10,
Oct 85, pp 8-9

[Article by Shao You [1421 0645]]

[Text] Several Chinese-developed aircraft and guided missiles were exhibited
at the Farnborough International Air Shows held in England from 31 August to
7 September 1986. This is the first time China's aircraft and guided missiles
have appeared at a large-scale international air show.

The attention-getting F-7M supersonic jet interceptor was among the military
aircraft exhibited. This is a developmental model of an interceptor developed
by China. It can undertake a variety of tactical missions such as intercep-
tion, fighter patrol, and close support.

A single-seat interceptor, the F-7M is not large, being only 14.89 m long
(including pitot tube), 13.95 m long (without the pitot tube), having a wing-
span of 7.15 m, a height of 4.10 m, an empty weight of 5,275 kg, and a normal
take-off weight of 7,531 kg. The aircraft has a single delta wing, semi-
monocoque fuselage, swept-back rudder and all-moving swept-back tailplane,
tricycle landing gear, and a WP-7BM engine. The wings are the symmetrical
type, with a surface area of 23 m^2; leading edge backsweep is 57°, there is
a 2° negative dihedral. Flaps are installed on the inboard main wing trailing
edges and the ailerons are on the outer side. A ventral fin is installed on
the after fuselage. The aircraft has a drag chute and chute compartment on
the trailing edge at the base of the vertical tail. When the aircraft is on
the ground after touching down, deploying the drag chute can reduce landing
distance. In addition to a rack fixed under the fuselage, the F-7M also has
four racks under the wings. Externally, it closely resembles the F-7, but
from the position of the pitot tube on the nose, they can be distinguished at
a glance. This is because on the former it is above the nose and on the lat-
ter it is below. In addition, there are only two hardpoints under the wings
of the F-7.

The WP-7BM engine is an axial-flow type turbojet engine and also has an after-
burner, and the exhaust can be moved using electrohydraulic controls. The
engine is 4.60 m long, outer diameter of the turbine is 0.72 m, maximum
diameter is 0.91 m, maximum height is 1.09 m, and net weight is 1,110 kg. Its
standard thrust is 3,420 kg, maximum thrust is 4,400 kg, and afterburner

thrust is 6,100 kg. In the nose of the plane there is a no-step continuously adjustable shock cone in the air inlet and a blast gate, intended to improve the engine's operating conditions when the aircraft is at a high M number and a large angle of attack. The aircraft has six fuel tanks in the forward fuse-lage and in the two wings. A bulkhead divides the fuselage into fore and aft sections, and since the aft section can be opened up, most of the engine is exposed, making maintenance easier.

The aircraft has a sealed cockpit and its temperature, pressure, and oxygen supply can be automatically regulated. The emergency ejection seat was made by the Chengdu Aircraft Company. It performs well, is safe and reliable, has a zero altitude ejection capability, and can also be ejected manually. Ejec-tion speed is 130-850 km/hr. Test data indicate that within the overall speed and altitude range of the flight envelope, the safety seat's efficiency is 100 percent. The height of the entire seat can be adjusted for the comfort of the pilot and to obtain the best field of view.

The F-7M is equipped with advanced avionics such as the model 956 head-up dis-play with a weapon-aiming computer, a search radar with excellent range-finder and anti-interference capability, a new model atmospheric data computer, new model radar altimeter, and model AD3400 UHF/VHF multifunction radio communica-tions system.

The model 956 head-up display is mounted directly in front of the pilot. Its screen displays data necessary for flight and weapon's firing, such as alti-tude, speed, course, angle of attack, and target number, bearing, and distance. Since it can store the functions of some 32 weapons parameters, not only does it expand the array of weapons which the aircraft can carry, but also is bet-ter suited to changing roles of weapons systems. When carrying out a ground attack, the pilot must be concerned with controlling dive angle, speed, and altitude, thus with one look at the screen he will have all this information. In air-to-air combat, he can also change the mode of attack quickly, for example, attacking with missiles, using conventional gunnery, and carrying out a snapshoot attack. In addition, it also has two navigational functions, and can provide landing attitude of the aircraft's approach and reliable aiming ring.

The search radar is installed in the nose of the aircraft with the antenna installed in the inlet cone in the nose. It has strong anti-interference capability. The data detected by the radar goes through a computer and is then displayed on the headup display screen.

The standard weaponry of the F-7M aircraft consists of two 30mm cannon and two air-to-air missiles, primarily for interception and airspace defense missions. The two missiles are attached to the inside of the wing. Three models can be carried: PL-2, PL-2A, and PL-7. Matra R-550 missiles can also be carried.

If the underbelly and the two outboard wing racks are used to carry droptanks, the aircraft can carry out long-range intercept and combat patrol missions. The capacity of the droptanks is 500 liters and one, two, or three can be car-ried, depending on the tactical need. When the aircraft is carrying three droptanks and two missiles, it can patrol 40 minutes at an altitude of 11,000 m and engage in combat for 5 minutes.

When carrying out aerial combat and close support, the racks can carry rocket launchers or powerful bombs. It can fire model 57-2 rockets, and which can be used both to attack non-armored ground targets and mid-air targets in aerial combat. Each rocket launcher holds 18 rockets. The model 90-1 rockets are specially used for attacking armored ground targets. Each rocket launcher can hold seven rockets. There are four bomb types: 50, 150, 250, and 500 kg, which can be dropped in pairs or separately.

When the aircraft is carrying a 150 kg bomb on one wing and a 500-liter auxiliary fuel tank on the other, flying at high altitude, the aircraft can travel rather far and carry out aerial combat missions. If the aircraft is not carrying an auxiliary fuel tank, but is carrying four rocket launchers under the wings, it can carry out close support at altitudes below 500 m.

F-7M performance data is as follows (carrying two PL-7 missiles):

Maximum M number, 2.05; cruise speed, 2,175 km/hr; static ceiling, 18,700 m; maximum sea level climb rate, 180 m/sec; horizontal flight acceleration time (altitude of 5,000 m, from M 0.9 accelerating to M 1.2), 35 seconds; maximum sustained banking angle, 14.7°/sec (sea-level, M 0.7); take-off distance 700-950 m, landing distance (using drag chute) 600-900 m; maximum cruising range 2,230 km, maximum overload +8g.
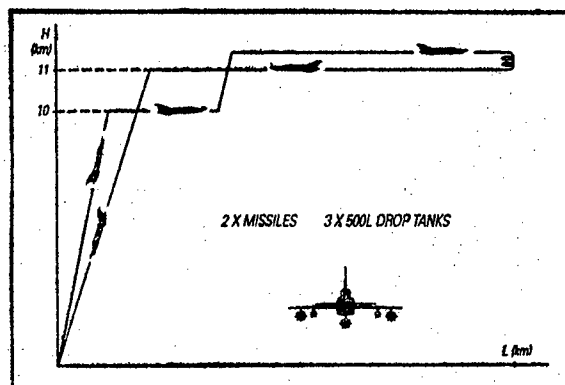
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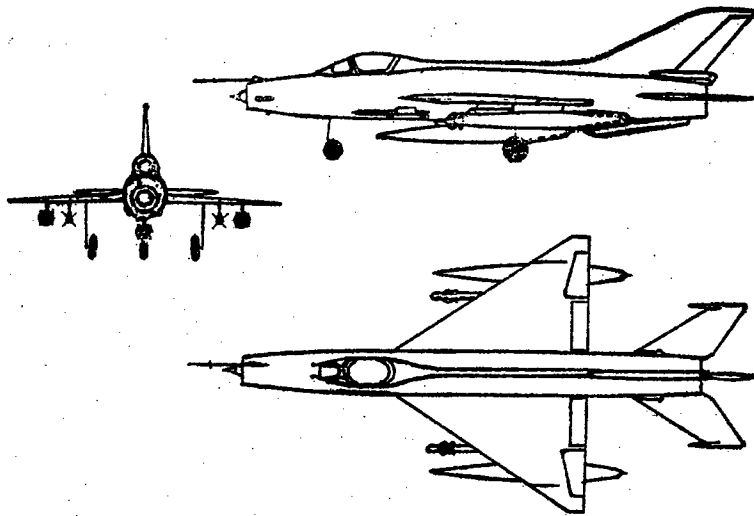
Three-sided view
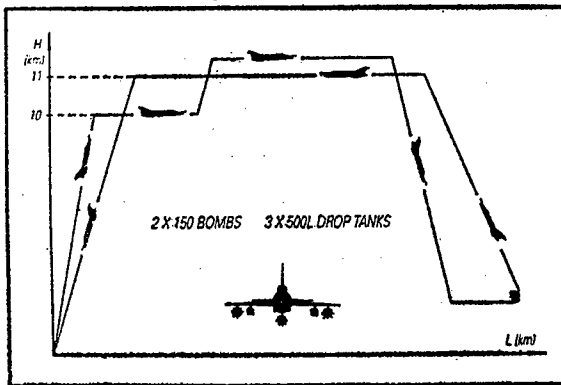
Aerial combat

Close support

8226/12859
CSO: 4008/16

GALVANOMETER Q-SWITCH

[Abstract of article by Xu Huiren [1776 1920 0088], Shi Yaling [2457 0068
3781], Gong Huanming [7895 3562 2494], and Chen Jianren [7115 0256 0086],
Shanghai Institute of Laser Technology]

[Text] The paper presents the operating principle of a galvanometer Q-switch
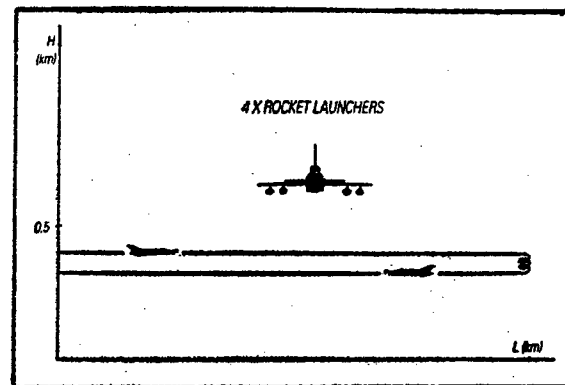and the experimental results of measuring the average power, maximum repeti-
tion rate, pulse width, and peak power of a continuously pumping, vibrating-
mirror type repetition Q-switch Nd:YAG laser. Features of the Q-switch
include its design simplicity, low light consumption, and stable, reliable
performance. In the experiment, the dimensions of the Nd:YAG crystal used
in the experiment were $\phi4$ x 70 mm; grating aperture, 1.6 mm; distance from
the oscillation reflection mirror to grating, 90 mm; input power of krypton
arc lamp, 1.7 kW; single-mode continuous power output, 0.64 W; average power,
800 Hz at 0.1 W; pulse half-width, 100 ns; and peak power, 1.25 kW (a photo-
graphed light pulse is shown in one of three figures). Two other figures
show the layout of the vibrating mirror, as well as a curve relating the
deflection angle and frequency. The laser has been used in forming aluminum-
coated dacron thin film with holes shaped in perfect, even-sized circles.
The paper was received for publication on 18 March 1986.

10424/6091
CSO: 4009/02

DESIGN OF ULTRASONIC VIBRATING MIRROR MODULATOR FOR YAG LASER

[Abstract of article by Gong Xueqing [7895 1331 3237], Shanghai Institute of
Laser Technology]

[Text] The paper presents the design of an ultrasonic vibrating-mirror
modulator for YAG lasers. The performances and the manufacturing methods
of the four practical versions are compared. The mirror modulator for YAG
lasers described here has been operating satisfactorily for 3 years without
any insertion losses. The operating principle of the mirror modulator lies
in the fact that some crystals may cause mechanical displacement when sub-
jected to an electric current. The author utilizes this effect to vary the
length of the laser's resonance oscillation chamber. If the periodic varia-
tion of the chamber length is in excess of one-half the wavelength, the
effect of optical stationary waves in the chamber can be eliminated for the
purpose of attaining peak modulation. Four figures show four modulators
used in modulating laser peaks, waveforms before and after modulation, the
equalizing effect of a piezoelectric ceramic, and the fundamental principle
of settling up a driving source. The author is grateful to Professor Wei Moan
[7614 1075 4152], researcher Xiang Dawei [0686 1129 1218], and colleague Yu
Sancheng [0205 0005 4453] for their advice and assistance. The paper was
received for publication on 1 February 1986.

PICOSECOND STREAK CAMERA INVESTIGATION OF GAIN DYNAMICS OF PASSIVELY MODE-LOCKED DYE LASER

[Abstract of article by Wang Shuicai [3769 3055 2088], Xian Institute of Optics and Precision Mechanics, Chinese Academy of Sciences]

[Text] The paper studies the gain dynamics of a passively mode-locked dye laser using a picosecond streak camera. The ultrashort-pulse shape, duration, and intensity are investigated for a large number of oscillations. Gain optimization of the passively mode-locked dye laser is discussed as follows: laser gain increases with increase in relative pumping intensity. After reaching a peak value, the gain gradually decreases at a rate correlated with the dye solution concentration of the locked mode. For steady operation, the optimized gain is mainly determined by the modulating wavelength. In the range where there is no apparent relationship between the gain and modulating wavelength, this gain is the optimized gain. Seven figures show the experimental layout, optical pulse shape, and waveforms obtained by the streak camera; relationships among laser gain, pulse width, and modulating wavelength; and a relationship curve of laser gain, pumping power, and pulse width.

APPLIED SCIENCES

MACROSCOPICAL BEAM-PLASMA KINK INSTABILITY RESEARCH IN TOKAMAK

[English abstract of article by Xu Xueqiao [1776 1331 2890] and Huo Yuping
[7202 5940 1627] of the Institute of Plasma Physics, Chinese Academy of
Sciences, Hefei]

[Text] In this paper, the kink modes of the plasma in a tokamak with
parallel NB injection are studied. The fast ion component of the plasma
has been modeled by a mono-energetic ion beam. Neglecting the dissipative
process, an energy principle can be derived from the Vlasov equation at a
low frequency and small Lamar-radius limit. It is found that none of the
entemal kink modes ($m \geq 2$) are influenced by the ion beam in the thintorus
approximation. However, the existence of the fast ion component changes the
kink modes ($m = 1$). Obviously, by proper choice of the velocity profile of
the ion beam $m = 1$, $n \geq 2$ modes can be stabilized absolutely. The behavior
of the $m/n = 1/1$ kink mode is very complicated. It can be stabilized or
destabilized depending on the beam energy β_b, axial safety factor $q(0)$ and
radial velocity profile of the beam. A numerical calculation shows that
when $q(0) < 0.924$ and the beam velocity is properly chosen, the $m/n = 1/1$
mode can also be totally stabilized.

NEW DISPLAY FOR PLASMA MICROWAVE INTERFEROMETER

[Article by Zheng Shaobai [6774 1421 4101] and Yang Xuanzong [2799 1357 1350] of Institute of Physics, Chinese Academy of Sciences]

[Abstract] One major disadvantage of the conventional z-axis glow display mode is that a computer cannot be used to collect the experimental results; instead, the results can be retained only by photography in recording the discharge of a Tokamak apparatus. As shown in one of four figures, the data-capture system consists of an analog-to-digital converter, a buffer and a controller to process the simulated voltage signals. The main indexes are as follows: the highest frequency recorded, 40 kHz; discrimination at 8 digits; voltage input range, between 100 mV and 25 V; data storage, 2K bytes; and a computer (Apple II) using a software that merges machine language and BASIC. Another figure shows the experimental results on a CT-6B Tokamak experimental apparatus using the new display method. Two additional figures show the operating principle of a frequency modulation type streak moving interferometer, and a schematic diagram of the sampler-retainer.

10424/12951
CSO: 4009/06

APPLIED SCIENCES

ELECTRON CYCLOTRON RESONANCE HEATING METHOD FOR CREATING ENERGETIC ELECTRONS
IN HIGH β TOKAMAK

[English abstract of article by Chen Yanping [7115 7159 5493], et al., of the
Institute of Physics, Chinese Academy of Sciences]

[Text] Rosenbluth et al. have suggested that energetic particles trapped in
an unfavorable curvature region of a tokamak can provide an access to the
second stability region. The ECRH processes for achieving this novel state
in a reactor tokamak are proposed. The RF within the proper ranges of
frequency and wave vector are injected from the outside of the tokamak of a
chosen magnetic surface. Only a small percentage of electrons can be heated
by the high electron cyclotron harmonic resonance successively. The numerical
results show that heating is efficient for both ordinary and extraordinary
modes.

CSO: 4009/14

PRESSURE DEPENDENCE OF ABSORPTION EDGE OF SEMIMAGNETIC SEMICONDUCTORS $Cd_{1-x}Mn_xTe$

[English abstract of article by Shan Wei [0830 0251] and Zhu Haorong [2612 3185 2837], et al., of Shanghai Institute of Technical Physics, Chinese Academy of Sciences; Zhao Minguang [6392 2404 0342] of the Department of Physics, Sichuan Teachers' College, Chengdu]

[Text] The effect of pressure on the optical absorption edge for mixed crystals $Cd_{1-x}Mn_xTe$ with different manganese concentrations in the range of 1 bar to 40 kbar and at room temperature is reported. The observed absorption edge shifts to higher energy with increasing pressure at a rate of α = 6-8 x 10^{-3} eV/kbar and a second order coefficient with the order of magnitude of 10^{-5} eV/kbar^2 for samples with x < 0.5; it shifts to lower energy with increasing pressure at a rate of α = -5.0 x 10^{-3} eV/kbar for samples with x $\geq$ 0.5. A phase transition from the zinc blend to the NaCl-type structure occurs for all samples studied. The transition pressures depend on the Mn content in the samples in the region of 25-40 kbar. The physical origins of different pressure coefficients are discussed in light of the deformation potentials of the energy band states and the hybridization of the Mn^{2+} 3d levels with p-like states in the valence band.

CSO: 4009/14

INVESTIGATION OF CRYSTALLIZATION PROCESS OF AMORPHOUS LITHIUM IONIC CONDUCTOR B_2O_3-$0.7Li_2O$-$0.7LiCl$-xAl_2O_3 WITH ONE DIMENSION ANGULAR CORRELATED POSITRON ANNIHILATION RADIATION

[English abstract of article by Su Fang [5685 2499], et al., of the Center of Fundamental Physics, University of Science and Technology of China, Hefei]

[Text] One dimensional angular correlated positron annihilation radiation curves of the amorphous lithium ionic conductor B_2O_3-$0.7Li_2O$-$0.7LiCl$-xAl_2O_3 (x = 0.15, 0.10, 0.05) during the crystallization process have been measured, and the linear parameters S in normalized dispersion of the electron momentum have been calculated. From the parameters S we can also disclose the variations in defect-density during the crystallization process.

Experimental results show that the parameters S at room temperature are not largely affected by the content of Al_2O_3. Each one greatly decreases after the full crystallization process and slightly increases at the beginning of crystallization, but increases anomalously at about 400-450°C only when x = 0.15. These results verify and complement the results obtained from measuring the average positron lifetime. The authors are convinced from these results that the boundary layer contains many defects.

CSO: 4009/14

APPLIED SCIENCES

SPACE-TIME STRUCTURE OF SUPERPOSITION OF TWO COLINEAR KERR BLACK HOLES' METRICS

[English abstract of article by Huang Chaoguang [7806 6389 0342], et al., of the Department of Physics, Beijing Normal University]

[Text] The space-time structure of the superposition of two colinear Kerr black holes is studied by the imaginary Weyl coordinate method. The space-time region within the horizons in this case is described. Also, the variation of the shape of the inner infinite redshift surface and the position change of singularities with z_0 when $2z_0 > \sqrt{M_1^2 - a_1^2} + \sqrt{M_2^2 - a_2^2}$ is obtained. From this, we can conclude that when $z_0 \to \sqrt{M^2 - a^2}$, the space-time structure does not tend toward one Kerr space-time for parallel identical Kerr solutions or one Schwarzschild-NUT metric for anti-parallel identical Kerr solutions, even though the structure of the space-time outside the outer horizons does, and that solutions of Einstein's equations exist without naked singularities (but not without any singularity) when $2z_0 > \sqrt{M_1^2 - a_1^2} + \sqrt{M_2^2 - a_2^2}$.

APPLIED SCIENCES

FEEDBACK STABILIZATION OF AXISYMMETRIC MODES IN NON-CIRCULAR TOKAMAKS

[English abstract of article by Zhang Zuoyang [1728 1563 7122], et al., of
the Institute of Plasma Physics, Chinese Academy of Sciences, Hefei]

[Text] The feedback stability of the axisymmetric MHD mode in tokamaks with
unclosed shells has been studied analytically through solving directly the
boundary problem of the perturbed magnetic surface in the vacuum region. For
plasma torus with an elliptical cross-section, a feedback system with a
conducting shell and active control coils is suggested. The results show
that two unclosed shells arranged above and below the plasma have a very
strong stabilizing effect. The resistive shell can suppress the modes with
a faster growth rate and the active coils can be used to stabilize the
slower modes.

CSO: 4009/14

APPLIED SCIENCES

SPUTTERED ALUMINUM-CARBON-OXYGEN SOLAR SELECTIVE ABSORBING SURFACES

[English abstract of article by Yin Zhiqiang [3009 1807 1730] of Qinghua University, Beijing]

[Text] The calculations of the Al-C-O/Al solar selective absorbing surfaces have been carried out. Reasonable agreement is obtained between the computed and experimentally measured reflectances and absorptances for multilayer Al-C-O thin films on an aluminum base layer, prepared using magnetron sputtering and a single aluminum cathode. The solar absorptance of the Al-C-O/Al selective surface is about 0.92 and the emittance (room temperature) around 0.04. The sputtering system is simplified and more efficient for the use of an aluminum cathode.

ON APPLICATIONS OF PARAMETRIC ACOUSTIC SOURCES TO SHALLOW WATER

[English abstract of article by Qian Zuwen [6929 4371 2429], et al., of the
Institute of Acoustics, Chinese Academy of Sciences]

[Text] As has been shown by Westervelt, the difference-frequency sound
pressure of the parametric array in the far field is proportional to the
second power of f/f_0, the downshift ratio of the frequency. However, different
results may occur in the near field, especially when the distance to the field
point is much less than the length of the parametric array but larger than R_0,
th Rayleigh length of the transducer. In this paper, the authors' previous
theory is applied to the case of shallow water and an expression for the
parametric array design is given. It is shown that the parametric pressure
is proportional to R_0, instead of proportional to the length of the parametric
array or to the second power of f/f_0. Furthermore, an analysis of Moffett and
Mellen's theory is made in this paper and an identical expression is obtained.
Finally, an experiment is carried out in a pool, and the results obtained
support the theory.

CSO: 4009/14

NEW CRITERION FOR CONSTRUCTING STRUCTURAL MODEL OF BINARY AMORPHOUS ALLOYS

[English abstract of article by Wang Jinghan [3769 0079 3352] and Li Dexiu [2621 1795 0208] of the Department of Physics, Yunnan University, Kunming; Cheng Xianan [4453 0341 1344], et al., of the Department of Applied Mathematics and Physics, Beijing Institute of Aeronautics and Astronautics; Chen Jinchang [7115 6855 2490] of the Department of Physics, Beijing Teacher's College]

[Text] The relative distribution of the metalloid atoms is one of the most important characteristics of the chemical short-range order in the structure of amorphous alloys consisting of metal-metalloid. Based on this idea, a new criterion for constructing the structural model of this kind of alloy is proposed, and several models are made by a computer with this new criterion which simulate the structures of the amorphous alloys $Ni_{64}B_{36}$, $Fe_{80}B_{20}$, $Ni_{81}B_{19}$ and $Co_{81}P_{19}$ respectively. All of the partial distribution functions of these models are in agreement with the experimental results. These results are also compared with those in other authors' works and discussed.

CSO: 4009/14

KINETIC STUDIES OF KrF* AND Kr_2F* IN $He/Ar/Kr/F_2$ MIXTURES

[English abstract of article by Gu Zhiyu [7357 0037 3768], et al., of Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Hefei]

[Text] By investigating the time integrated spectra, the kinetics of Kr_2F* in fast discharge excited $He/Ar/Kr/F_2$ mixtures have been studied, and the path features of the formation of Kr_2F* have been probed. According to the theoretical analysis and experimental results, it is shown that under the fast discharge excitation, the three-body collision reactions $KrF* + Kr + M \rightarrow Kr_2F* + M$ are the main paths to the formation of Kr_2F* and KrF*, which can be formed efficiently via the displacement reaction $ArF* + Kr \rightarrow KrF* + Ar$. The corresponding formation rate constants of Kr_2F* have been measured by the experiments.

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CSO: 4009/14

LOW TEMPERATURE MAGNETIC PROPERTIES OF AMORPHOUS Sm-Fe AND Sm-Co THIN FILMS

[English abstract of article by Dai Daosheng [2071 6670 3932], et al., of the
Department of Physics, Beijing University]

[Text] The low temperature magnetic properties of amorphous Sm-Fe and Sm-Co
thin films are investigated. It is found that there exists a distribution of
the orientation of the Fe atomic moment in the Sm-Fe films, and the composi-
tional dependence of the effective magnetic moments of the Co atoms in the
Sm-Co films is very similar to that of the amorphous Nd-Co films. The magnetic
structures of these two alloy systems are determined: asperomagnetic structure
for the Sm-Fe thin films and collinear ferromagnetic structure for the Sm-Co
thin films. The magnetic moment of the Sm atoms is very close to zero.

The strength, temperature and compositional dependences of coercivity for
these two amorphous alloy systems are measured. The H_c of the Sm-Fe films
is much larger than that of the Sm-Co films. As for the Sm-Fe amorphous
films, H_c increases very quickly with an increasing of the contents of
samarium, and severely drops with an increasing of temperature in the very
low temperature region. However, for the Sm-Co amorphous films, H_c reaches
a maximum at about 43 at percent Sm, and decreases with an increasing of
temperature in the exponential form.

It is also found that the temperature dependence of magnetization in the low
temperature region may be caused by Bloch spin-wave excitation and Stoner
electric excitation simultaneously.

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CSO: 4009/21

APPLIED SCIENCES

KINETIC THEORY ON BALLOONING-MODE IN COLLISIONAL PLASMAS

[English abstract of article by Pan Chuanhong [3382 0278 4767], et al., of Southwestern Institute of Physics, Leshan, Sichuan]

[Text] The authors have studied the kinetic effects on the ballooning-mode more completely from the gyro-kinetic theory. In this paper they consider the effects of the following factors: collision, hot-ion components, such as neutral beam injection or fusion α-particles, particle diamagnetic drift, and ion gyro-radius, as well as trapped particles. It is shown numerically that both the gyro-radius of ions and trapped particles have stabilizing effects on the ballooning-mode, whereas the collision term has a destabilizing effect. In addition, the kinetic theory reproduces the results given in ideal MHD theory, i.e., the shear can improve the stability of the ballooning-mode.

APPLIED SCIENCES

QUASI REAL SPACE (QRS) IMAGE SIMULATION IN HIGH RESOLUTION ELECTRON MICROSCOPY

[English abstract of article by Wang Yuanming [3769 0337 2494], et al., of the Laboratory of Atom Image of Solids, Institute of Metal Research, Chinese Academy of Sciences, Shenyang]

[Text] This paper reports a study of the quasi real space (QRS) method. It is an intermediate procedure between the real space (RS) and multislice (MS) methods. With this technique, most of the numerical calculations are done in real space, except that normalization is imposed beyond some threshold value, e.g., $\Sigma|\phi|^2 > 1.01$, where ϕ is the wave function of the electron. It is also shown why truncation of the propagation operator $e^{\lambda \epsilon \Delta}$ to the second order in the RS method can lead to computational divergencies and how they can be avoided by using the QRS method. Finally, results calculated by the QRS method are compared with those of other existing slice methods. The QRS method gives results similar to those of conventional MS calculation with competitive computational speed.

CSO: 4009/21

APPLIED SCIENCES

STUDIES OF INTERACTION BETWEEN PROMOTER Co AND HIGHLY EDGED SURFACES OR ION SPUTTERED BASAL PLANE OF MoS_2 CRYSTAL

[English abstract of article by Hu Yongjun [5170 3057 6511], et al., of the Institute of Physics, Chinese Academy of Sciences]

[Text] To elucidate the promotion action of cobalt on Mo sulfide catalysts, UPS, XPS and LEED have been applied to study the submonolayer deposit process of the promoter metal Co on the active catalytic phase for the Co-Mo catalyst-- the highly edged surfaces and ion sputtered basal plane of MoS_2 crystal. At a certain submonolayer coverage of deposited Co, the new Co-correlated inter- face states can raise the surface E_F to a new higher pinning position by about 0.30-0.35eV. Therefore, the surface barrier and work function for these catalytic active phases are decreased. The remarkable changes for the electronic structure near E_F and the studies of LEED patterns reveal that the active phase Co-Mo-S, in which the Co-Mo bond appears to behave in much the same way as in the intermetallic bond, can be formed by locating the promoter Co at the surface disorder defects in the edge sites.

CSO: 4009/21

ASYMPTOTIC BEHAVIOR OF WAITING TIME DISTRIBUTION FUNCTION (WTDF) $\psi(t)$ AND ASYMPTOTIC SOLUTIONS FOR CONTINUOUS-TIME RANDOM WALK (CTRW) PROBLEMS

[English abstract of article by Deng Huifang [6772 6540 5302] of the Department of Physics, Jiangxi Normal University, Nanchang]

[Text] In this paper, a new waiting time distribution function (WTDF), $\psi(t)$, is adopted to discuss asymptotic solutions for the continuous-time random walk (CTRW) problems. This WTDF is not purely exponential and is universally valid for explaining the low-frequency (that is, ω < 10GHz) fluctuation, dissipation, and relaxation properties of condensed matter. Many theoretically meaningful results are obtained, and they are in agreement with those of experiments. These results include the mean displacement, dispersive mobility, meansquared displacement, dispersive diffusion coefficient, Nernst-Einstein relation, variance and standard variance, lattice statistics, initial site occupation probability, dispersive conductivity, dispersive electrical transport and memory function. All results show that the CTRW process described by the WTDF $\psi(t)$ behaves as non-Markovian over the very broad time domain and as Markovian only in a long time limit, which is to say that all results contain a single parameter, n, the infrared divergence exponent, which depends on the microscopic structure of condensed matter and determines the degree of dispersion. The larger the value of n is, the stronger the dispersion becomes. When n = 0, the dispersion disappears and all results reduce immediately to the classical Markovian forms. This is in agreement with recent experimental results.

APPLIED SCIENCES

75-FS OPTICAL PULSE GENERATED BY CPM DYE LASER

[English abstract of article by Sun Diechi [1327 6613 4654], et al., of the Department of Physics, Fudan University, Shanghai]

[Text] The characteristics of the CPM dye laser have been investigated. The optical pulse width and wavelength of the CPM dye laser have been found to be dependent on the thickness and concentration of the saturable absorber. Under optimum conditions, a 75-fs optical pulse is obtained.
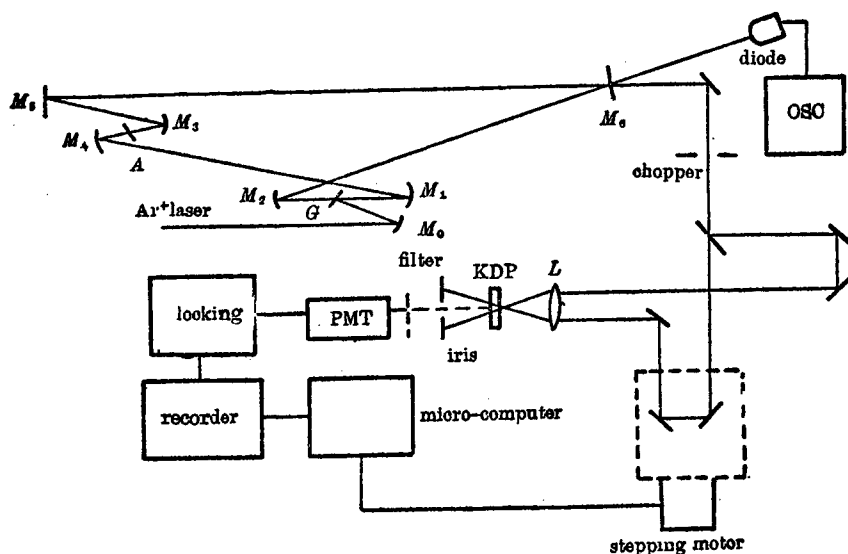
Schematic diagram of CPM dye laser and measurement apparatus

CSO: 4009/16

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INVESTIGATION OF TEMPERATURE DEPENDENCE OF YELLOW-GREEN LIGHT PULSES OF CVL

[English abstract of article by Ying Xixiong [2019 6932 7160], et al., of the Department of Physics, Zhejiang University, Hangzhou]

[Text] An investigation of the temporal behavior of yellow-green light pulses as a function of the excitation current pulse of CVL at various discharge-tube temperatures has been made. It has been confirmed that the tube temperature corresponding to the minimum pumping time is consistent with that relating to the maximum pulse energy. Influences of the initial metastable state population on the variations of relative behaviors of the yellow-green light are discussed.
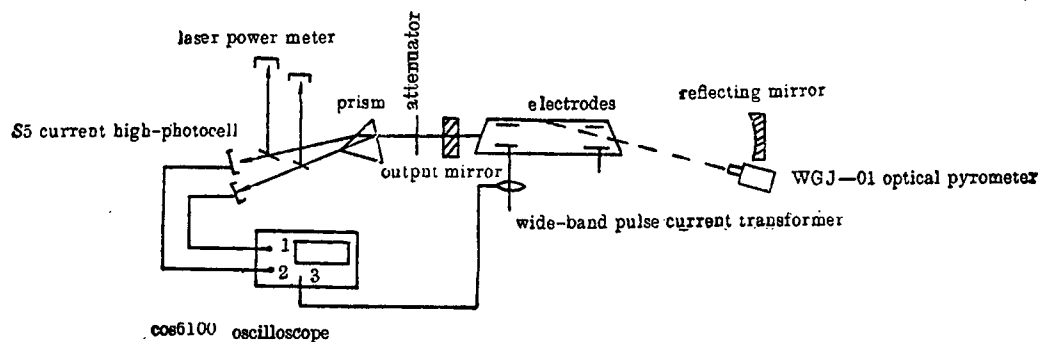
Experimental arrangement

CSO: 4009/16

SECOND HARMONIC MODE-LOCKING OF Ar$^+$ LASER

[English abstract of article by Bao Xiaoyi [7637 2556 3015], et al., of the Laser Spectroscopy Laboratory, Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Hefei]

[Text] In this paper the authors describe the principle and characteristics of the second harmonic mode-locking of an Ar ion laser. In their experiment, there are two light pulses in an Ar ion laser cavity at any time and the mode spacing for the second harmonic mode-locking of the Ar ion laser is about 210 MHz, twice that of the fundamental. This increases the average output power of the Ar ion laser by a factor of two. A theoretical explanation for the observed phenomena is presented.
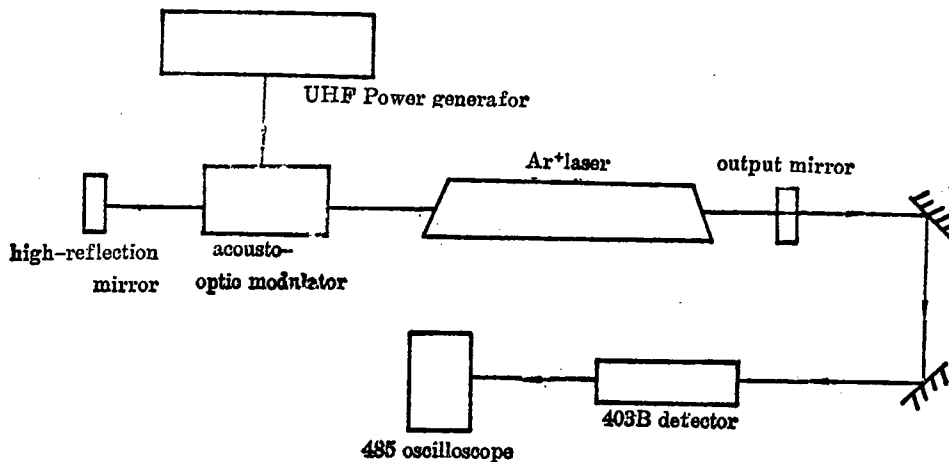
Experiment 1 set-up of the second-harmonic mode-locking of Ar$^+$ laser

CSO: 4009/16

STIMULATED RAMAN SCATTERING OF XeCl EXCIMER LASER RADIATION IN Pb VAPOR

[English abstract of article by Huo Yunsheng [7202 5366 3932], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The parametric dependence of the output energies and efficiency for the Raman conversion of XeCl excimer laser radiation in Pb vapor has been studied. Pulses at the Raman-shifted wavelength, with 120 mJ energy and 2 MW peak power, have been obtained. Multi-peak structures of the waveforms of Raman-shifted pulses were observed; they can be attributed to the cooperative effects in Raman scattering.
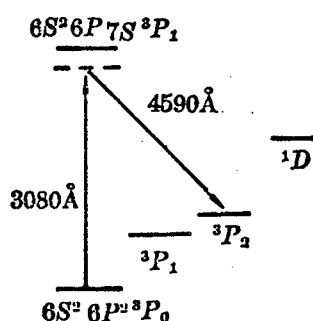
Fig. 1 Partial energy level
diagram of Pb showing the
Raman conversion scheme
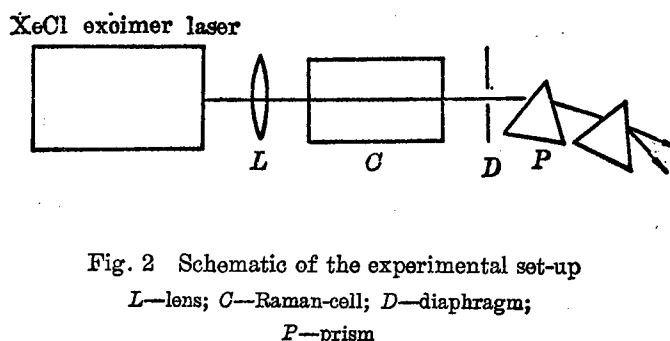
Fig. 2 Schematic of the experimental set-up
L—lens; C—Raman-cell; D—diaphragm;
P—prism

CSO: 4009/16

APPLIED SCIENCE

FAR-FIELD RING PATTERN OF LASER-INDUCED THERMAL SELF-DEFOCUSING

[English abstract of article by Li Chunfei [2621 3196 7378], et al., of the Department of Physics, Harbin Institute of Technology]

[Text] Using a formula for the ray deflection angle, the authors obtain a clear and detailed interpretation for the ring pattern of laser-induced thermal self-defocusing. The far-field intensity distribution at different input powers and different positions of the beam waist are discussed. The threshold power for the ring pattern and a formula for the number of rings are obtained. All of the theoretical conclusions have been confirmed by experiments. In addition, a fine structure in the ring pattern resulting from the diffraction effect is also described.

CSO: 4009/16

APPLIED SCIENCE

THEORETICAL STUDY OF NONDEGENERATE TWO-PHOTON OPTICAL MULTISTABILITY

[English abstract of article by Zheng Hang [6774 2635], et al., of the Department of Applied Physics, Shanghai Jiaotong University]

[Text] By using the quantum method, the nondegenerated two-photon optical multistability equations applicable to arbitrary detunings with respect to the intermediate level have been deduced. The authors put emphasis on the multistability characteristics of the pure absorption type because this type has potentiality in practical utility. Numerical calculations reveal some new features. It is pointed out that the multistable characteristics of the two modes are different. This difference results from the difference between the upper and lower levels. A nondegenerate two-photon multistability system can be used as multi-logical elements, or such a system with small intermediate level detuning. The operation intensity is about the same as that for the single-photon optical bistability. Therefore, it is predicted that in the near future the nondegenerate two-photon multistability will be realized experimentally.

CSO: 4009/16

APPLIED SCIENCE

STUDY OF BROAD-BANDPASS FILTERS WITH INDUCED TRANSMISSION

[English abstract of article by Yang Shumei [2799 2885 2734] of Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] A new type of broad-bandpass filter with induced transmission in the region of 0.4 ~ 1.1 µm is described together with its advantages and applications. The design method is presented for these filters and filters of variable broad-bandpasses with induced transmission in the region of 0.4 ~ 0.7 µm as well as 0.7 ~ 1.1 µm. The rules of linear variations of the matching layer and metal layer on the filter are summed up. The matching coefficient and physical thickness of the metal layer in the region of 0.4 ~ 1.1 µm are calculated. Finally, parametric analyses of typical designs are presented together with an experimental demonstration and an example of application.

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CSO: 4009/16

APPLIED SCIENCES

TRANSMISSION CHARACTERISTICS OF CORNER PATTERN THROUGH PROJECTIVE OPTICAL
SYSTEM

[English abstract of article by Zou Haixing [6760 3189 5281] of Shanghai
Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] In this paper, the integral equation of two-dimensional diffraction
is introduced. The intensity distribution of the two-dimensional diffraction
of a corner pattern through a projective optical system is computed numerically.
A simplified transmission model of the corner pattern is suggested. The calcu-
lated value of the round radius of the corner pattern through the projective
optical system is in agreement with the measured value.

CSO: 4009/19

APPLIED SCIENCES

TUNING CHARACTERISTICS OF SEMICONDUCTOR LASER WITH EXTERNAL DISPERSIVE CAVITY

[English abstract of article by Xu Zhizhi [6079 4249 2972], et al., of the Department of Radio Electronics, Qinghua University, Beijing]

[Text] The continuous and accurate tuning of a semiconductor laser with an external dispersive cavity over the whole frequency range determined by oscillating conditions can be achieved by varying the temperature and injection current of the laser diode and the length of the external cavity. This article reports the principles and some experimental results.

CSO: 4009/19

APPLIED SCIENCES

TWO-WAVE INTERACTION BSO CRYSTALS

[English abstract of article by Yan Yuan [0917 3850], et al., of the Department
of Applied Physics, Shanghai Jiaotong University; He Chongfan [0149 1504 5672]
of Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[Text] Starting from the mechanism of intensity-dependent absorption found
experimentally in BSO crystals, the authors derive nonlinear coupled-wave
equations taking the interaction between self-diffraction and recording of
grating into account. They are used for describing the two-wave interaction
in BSO crystals. Using the model for dynamic interaction, a numerical solution
method is put forward. The calculated results successfully account for the
disagreement between previous theories and experiments. The characteristics
of the two-wave interaction are calculated under various physical conditions.
They have been born out by experiments.

CSO: 4009/19

APPLIED SCIENCES

PULSED MEASUREMENT OF GaP:N PHOTOLUMINESCENCE

[English abstract of article by Huang Qinglong [7806 3832 7893], et al., of
the Department of Physics, Zhejiang University, Hangzhou]

[Text] This paper describes the photoluminescence detection apparatus which
consists of a pulsed CuBr laser with a low duty cycle and a boxcar averager.
It features high sensitivity and good repeatability.

The photoluminescent spectra of a liquid-phase epitaxial GaP:N wafer have been
measured in the temperature range of 80~300 K and for different thicknesses.
Based on the spectra, the green-light emitting mechanism is analyzed. It is
found that the spectra are mainly composed of A-O and NN_1 peaks in the range
of 80~160 K, while the A peak and its phonon-associated peaks dominate over
the spectral in the range of 160~300 K. The NN_1 peaks are very prominent in
the spectra of different epitaxial layers. Analysis of NN_1 peaks can help
prepare highly efficient green-light-emitting GaP:N materials.

APPLIED SCIENCES

EXPERIMENTAL STUDY OF PARAMETRIC DEPENDENCE OF RADIATION FROM RAMAN FREE-ELECTRON LASER

[English abstract of article by Chu Cheng [5969 2052], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] Systematic measurements of an output radiation signal from a Raman free-electron laser indicate good agreement between experimental data and theoretical calculations. As a result, the optimal parametric region for the laser operation can be determined, making it possible to further improve the laser's performance.

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CSO: 4009/19

APPLIED SCIENCES

EXPERIMENTAL INVESTIGATION OF CHARACTERISTICS OF DIAMETER-EXPANDED SILENCERS

[English abstract of article by Dai Genhua [2071 2704 5478] and Wang Hongyu [3769 1347 3768] of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] An investigation of the characteristics of diameter-expanded silencers has been carried out experimentally and the following rules were obtained:
1. Silencers are effective only in a limited pneumatic pressure range and have maximum noise reduction when the condition $(P_0/P_{1,v})/(d^2_A/d^2_S) \simeq 0.81$ is fulfilled; 2. Silencers also have certain expansion selection, i.e., d_S/d_A must be larger than 1.5 and smaller than 2.5; 3. The length of the silencer has no marked effect on its characteristics in the effective pressure range;
4. The efflux noise of the silencer in the effective pressure range can be calculated according to the pressure dependence of turbulent noise and the correction of the ratio of expansion. The authors also present two interesting phenomena which are valuable for further study.
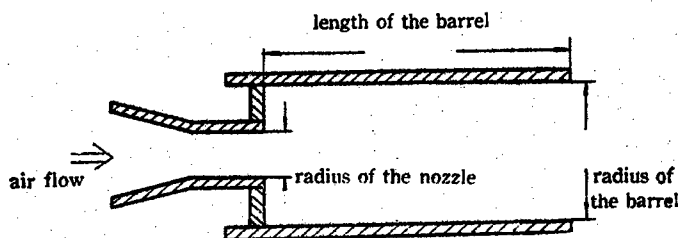
Configuration of diameter-expanded silencer

APPLIED SCIENCES

STUDY OF FS-PDMP SYSTEM

[English abstract of article by Zhang Shuying [1728 0647 5391] of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] A signal detection system, consisting of a frequency-stepping signal generator and a corresponding post-detected-matching processor, has been studied both theoretically and experimentally. The characteristic function determining the detection performance of the FS-PDMP system has been derived and analyzed, and a set of equipment, which can generate and process an eight-unit long signal with various FS modes [n] (T = 8τ = 200 ms, f_n = 1360 + nx40 Hz), has been made for the experimental studies. Some of the results are as follows: 1) The output waveforms of PDMP matched with many FS modes were recorded. It is shown that the output with a narrow mainlobe (duration = τ) and a few sidelobes (level < p/8, p is the peak of the mainlobe) can be obtained from PDMP with FS modes composed of eight different frequencies, and if there are two or more of the same frequencies in the FS modes either the mainlobe will widen or the sidelobe level will increase, or both will occur. 2) The response of the FS-PDMP system to the Doppler frequency β was investigated. For mode [01234567], the PDMP output gradually reduces from p to p/8 with the variation of β from 0 to ±280 Hz, and the time of output appearance correspondingly changes from 0 to ±7τ. For both modes [75310246] and [05274163], when β varies from 0 to ±40 Hz, the reduction of the mainlobe of the PDMP output is very fast, and no notable sidelobe appears for the former while there are two remarkable ones for the latter. 3) The detection threshold of the FS-PDMP system is about -8 dB lower than that of a single unit envelope-detector. The above results are in conformity with those of theoretical analysis.
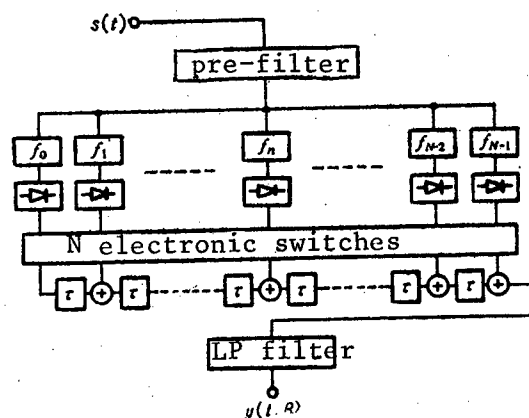
Principle diagram of Post-Detected-Matching-Processor

STUDIES ON INTRAHEPATIC HEPATITIS B VIRUS DNA IN 98 VIRAL HEPATITIS B PATIENTS

[Article by Wen Yumei [5112 3768 2734], Department of Microbiology, Shanghai Medical University, Shanghai, Liu Houjue [0491 0624 6877], Zhongshan Hospital, Shanghai, Chen Huizhu [7115 5610 3796], Department of Microbiology, Shanghai Medical University, Shanghai, Huang Yaoxing [7806 5069 2502], Department of Microbiology, Shanghai Medical University, Shanghai, et al.]

[Text]

Hepatitis B virus (HBV) DNA status in the liver tissues of 98 viral hepatitis B patients was studied by means of DNA hybridization with ^{32}P-labeled cloned HBV probe (pAM 12). In 57 serum HBeAg positive cases, HBV DNA was detected in 44 (77.19%), while in serum anti-HBe positive cases, 13/20 (65.00%) also showed evidence of HBV replication in liver tissues. Nine cases showed presence of HBV DNA integration into hepatocyte genomic DNA, but in most cases it was accompanied by free replicating forms. The significance of antiviral therapy in these patients was discussed.

Since hepatitis B virus (HBV) has not yet been successfully propagated in tissue culture system, studies on HBV DNA status in serum and liver tissues of viral hepatitis B patients have been pursued as one of the aspects to elucidate the replication and pathogenesis of HBV[1-3]. We previously reported HBV DNA status in 30 viral hepatitis B patients and found HBV replication in a number of anti-HBe positive patients, and intrahepatic HBV DNA integration rate in chronic hepatitis B patients was much lower than that reported from other countries.[4] In this paper we further studied the correlation of intrahepatic virus replication with the HBe/Anti-HBe system and the incidence of HBV DNA integration in 98 patients.

MATERIAL AND METHODS

Patients. Percutaneous liver biopsy specimens were obtained from 98 viral hepatitis B patients who were admitted to the affiliated hospitals of Shanghai Medical University from May 1983 to July 1985. Among the 98 patients 9 were children and 89 adults (male 84, female 14), and the age ranged from 16 months to 70 years. Based on pathological findings, there were 7 cases of acute hepatitis, 5 severe hepatitis, 58 chronic active hepatitis (11 with cirrhosis), 20 chronic persistent hepatitis, 6 were nonspecific chronic hepatitis, and 2 were generally normal.

Liver and serum samples. Liver tissues were immediately frozen and stored at -70°C for use, and serum samples were obtained on the same day or within 2 weeks of liver biopsy.

Assay for HBV serological markers. Serum HBaAg, anti-HBs and anti-HBc were assayed by ELISA kits (provided by Shanghai Medical

Diagnostic Institute) and HBeAg/anti-HBe by Abbott EIA kits.

Serum HBV DNA assay. As reported previously,[4] 40 μl of each serum sample was spotted onto nitrocellulose filter under vaccum suction by a 96 well manifold apparatus, denatured, neutralized and baked at 80 C for 2 hours. Filters were hybridized to ^{32}P-NTP (NEN product) labeled 3.2 kb HBV DNA probe (pAM12 1-2 × 10^8 cpm/μg DNA). Some serum HBV DNA negative samples were retested by extracting DNA from 300 μl of serum and hybridized with HBV DNA probe.

HBV DNA analysis from liver biopsy tissues. DNA was isolated from 2.5-9 mg of liver biopsies and digested by endonuclease EcoRl, electrophoresed on 1% agarose, denatured and transferred to nitrocellulose filter by Southern blot technique. Filters were hybridized with ^{32}P labeled HBV DNA, washed, dried and exposed to X ray films at -70 C for 7-10 days. Those showing hybridization signals at high molecular weight regions were checked by washing the filter at 100 C and rehybridized with a plasmid DNA probe. Only those signals that hybridized with HBV DNA probe but not with the plasmid probe were considered to be specific and were accepted as integration of HBV DNA.

RESULTS

Correlation of HBeAg/anti-HBe with serum and intrahepatic HBV DNA. Correlation of HBeAg/anti-HBe with serum and intrahepatic HBV DNA was analysed in 95 cases (in 3 cases serum samples were not available for e system assay), and summarized in Table 1. In serum HBeAg positive cases, serum HBV DNA was detected in 61.40%, and intrahepatic HBV DNA in 77.19%; whereas, in serum HBeAg negative cases, 26.13% were serum HBV DNA positive and intrahepatic HBV DNA detected in 47.36% of these patients. Though in anti-HBe positive cases, serum HBV DNA was detected only in 15%, intrahepatic HBV DNA was as high as 65%, very close to the positive rate of HBeAg positive patients. Thus, HBeAg/anti-HBe status did not correlate with replication of HBV, indicating the e system was not a reliable marker for HBV replication.

Anti-HBe and integration of HBV DNA. HBV NDA was detected in the live rbiopsies in 75 (76.53%) of the 98 cases. The hybridization pattern was a smear starting from 3.2 Kb, and in some cases hybridization signals were intensified at 2.0 Kb and 1.8 Kb, suggesting that ongoing virus replication was selectively stopped at certain length of the viral nucleic acid (Fig 1). Only in 9 of the 98 cases high molecular weight hybridizing signals were seen, indicating integration of HBV DNA. Five showed smear of high molecular weight hybridization and only 4 showed discrete bands (Fig 2, Table 2). All the nine cases were HBsAg positive and 4 were serum HBV DNA positive, but in 8 cases intrahepatic free and replicating form of HBV DNA coexisted with HBV DNA integration, suggesting that even in these patients, viral replication still persisted. Neither HBeAg nor anti-HBe was related to the presence of HBV DNA integration. 5 of the 9 cases were HBeAg positive (1 was also anti-HBe postitive), 2

Table 1. Correlation of HBeAg/anti-HBe with HBV DNA

	Serum HBeAg		Serum anti-HBe	Serum HBeAg/ anti-HBe
	+	—	+	—
	Cases (%)	Cases (%)	Cases (%)	Cases (%)
Serum HBV DNA	35/57 (61.40)	10/38 (26.31)	3/20 (15.00)	5/18 (27.78)
Liver HBV DNA	44/57 (77.19)	18/38 (47.36)	13/20 (65.00)	10/18 (55.56)
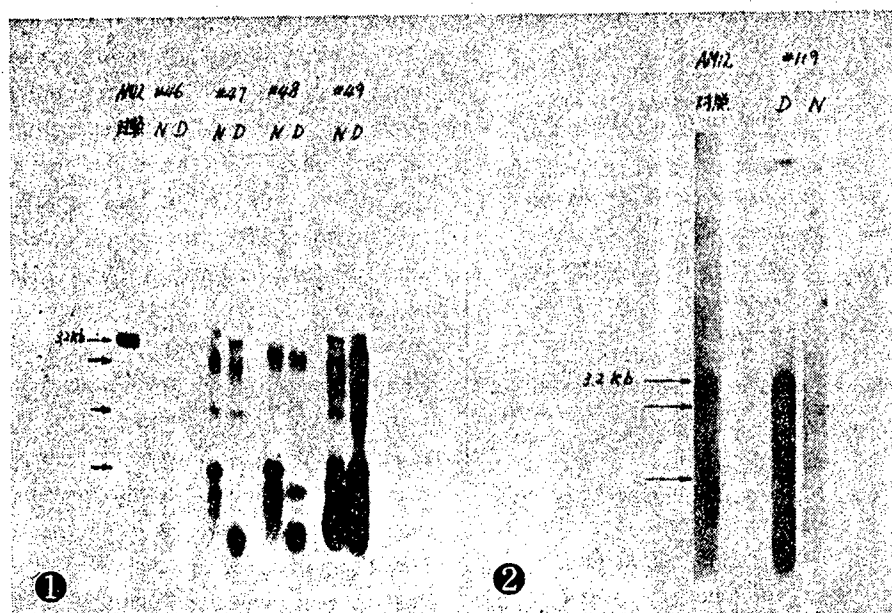
Fig 1. HBV DNA in liver tissues of viral hepatitis B patients. N: non digested, D: digested with EcoR1.
 Pts. No. 46-negative, No. 47, 48, 49 were positive. Hybridization signals were seen intensified at certain regions, corresponding to 2.8, 2.0 and 1.8 kb.

Fig 2. Integration of HBV DNA in liver tissues of viral hepatitis B patients.
 Pt. No. 119, N: nondigested, D: digested with EcoR1. After digestion there was a hybridization band at 24.3 kb, indicating integration of HBV DNA.

Table 2. Patients with HBV DNA integration in liver cells.

Case No.	Sex	Age	Serum HBV DNA	Intrahepatic HBV DNA		Serum		Pathological diagnosis
				Free	Integration	HBeAg	Anti-HBe	
19	M	30	—	+	smear	+	—	CAH
20	M	57	—	+	band	+	+	CAH, liver cirrhosis
28	M	28	+→—	+	smear	+	—	CAH
29	M	70	ND	+	smear	—	—	CAH
33	M	45	+	+	band	—	—	Nonspecific hepatitis
59	M	21	+	+	smear	+	—	Generally normal
72	M	52	+	+	smear	—	+	CAH
102	M	28	+	+	band	+	—	CAH
119	M	25	—	—	band	—	—	CAH

were anti-HBe positive and 3 were without serum HBeAg/anti-HBe markers. Only 2 of the 13 anti-integration, indicating a small number of our anti-HBe positive patients had virus DNA sequences

HBe positive patients had evidence of HBV DNA. into their chromosomal DNA of hepatocyte.

Positive rate of serum and intrahepatic HBV DNA in various groups of patients (Table 3).

Table 3. Serum and intrahepatic HBV DNA in various groups of patients.

Groups	Serum HBV DNA Cases (%)	Liver HBV DNA Cases (%)
Acute hepatitis	4/6 (66.66)	6/7 (85.71)
Severe hepatitis	1/5 (20.00)	4/5 (80.00)
CPH	10/20 (50.00)	15/20 (75.00)
CAH	23/58 (39.65)	44/58 (75.86)
CAH, liver cirrhosis	2/10 (20.00)	9/11 (81.81)

Note: In acute hepatitis group and CAH with liver cirrhosis group, there was one case in each group that serum sample was not available.

Based on pathological diagnosis, 90 viral hepatitis B patients of various groups were compared for their positive rate of serum and intrahepatic HBV DNA (6 nonspecific chronic hepatitis and 2 generally normal cases were excluded). As number of acute hepatitis and severe hepatitis cases was small, the difference was not statistically significant, however, the tendency of less serum HBV DNA positive cases (20%) in severe hepatitis and CAH with liver cirrhosis groups could still be seen. The positive rate of intrahepatic HBV DNA was similar in all groups, and no differences existed in serum HBV DNA.

DISCUSSION

Replication and pathogenesis of HBV have been chiefly studied in animal models[5] or in liver tissues from biopsies/autopsies of viral hepatitis B patients.[6-8] Usually, it was considered that in HBeAg positive patients there was active viral replication, while in anti-HBe positive patients viral DNA might be integrated into the cell genome without active replication, leading to persistence of serum HBsAg[9]. However, in certain racial groups, HBV continues to replicate following HBeAg to anti-HBe conversion. For instance, Mediterranean, African and Oriental patients, serum anti-HBe is often associated with HBV replication, presence of serum HBV DNA and inflammatory changes in their livers[10]. In our

series, HBV DNA in liver tissues was found in 65% (13/20) of anti-HBe positive cases, and integration of HBV DNA occurred only in 2 cases, which coexisted with free replicating forms. It indicated that HBV continued to replicate in spite of positive anti-HBe. It was reported that the prevalence of HBV replication in anti-HBe carriers from the Far East was 58%[10]. However, the incidence of HBV DNA integration in our patients was much lower than that reported by Kam[11]. It seems that low incidence of viral integration and high percentage of viral replication in anti-HBe positive cases is rather unique in patients from China. We also presented data indicating the limitation of relying on HBeAg/anti-HBe as markers for replication of HBV. Recently, Shafritz also commented that the HBeAg/anti-HBe status of the patients did not correlate with liver disease activity[12]. Therefore, to study the status of the e system, in relation to virus replication and pathological changes in the liver will be of importance in elucidation of the pathogenesis of HBV.

Since only 9 of our 98 (9.18%) cases showed intrahepatic HBV DNA integration, and in 8 out of these 9 cases free replicating forms coexisted with viral integration, it is obvious that antiviral treatment should be emphasized. If viral replication could be inhibited or terminated, clearance of the virus would be feasible. Yokosuka used recombinant interferon to treat 15 viral hepatitis B patients and on the follow-up study after a short duration, intrahepatic HBV DNA became negative in 4, decreased in 5 and unchanged in 6. No evidence of integration of HBV DNA was found, but supercoiled HBV DNA tended to remain after other forms were reduced.[13] It would be of interest to study the supercoiled form of HBV DNA in our patients in association with the persistence of the virus, as we also detected hybridization bands comparable to supercoiled form of HBV DNA at 2.0 Kb.

There were fewer serum HBV DNA positive patients in severe hepatitis and CAH with liver cirrhosis, but the presence of intrahepatic HBV DNA was similar in all groups studied. Chu studied the serum HBV DNA level in relation to liver damage in 79 patients[14] and found 90% of those with high level of HBV DNA in their sera showed minor hepatic inflammatory activity. In contrast, 76% of CAH or chronic lobular hepatitis had low level of HBV DNA. It was assumed that liver damage occurs during the period of clearance of hepatocytes supporting HBV replication. However, our study on HBV DNA both in serum and liver samples did not support this postulation, as serum HBV DNA was lower in severe cases and CAH with liver cirrhosis, but intrahepatic HBV DNA was similar in all groups. Therefore, the lower incidence of serum HBV DNA in severe case might be due to decreased cell mediated cytotoxicity, or there might be viral strains of higher hepatotrophic virulence that induced severe damage in livers.

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/6091
CSO: 4010/1017

STUDIES ON MUNTIACUS MUNTJAK CELLS INFECTED WITH POLIOVIRUS

[English abstract of article by Wang Hong [3769 5725], Guo Ren [6753 0088], and Liu Kaimin [0491 7030 3046] of the Institute of Medical Biology, Chinese Academy of Medical Sciences, Kunming]

[Text]

For a long time, that cells susceptible to poliovirus infection are limited only to primates has been reported. We used the established muntiacus muntjak lung diploid cell line (KIZ-7901) to study the biological effects of poliovirus infection. Results showed that chromosome aberration rates of the cells infected with 100 TCD_{50} of the virus per cell were 9.0-14.7%, while that of the control cells was only 3%. Chromosome aberration types included break, fragment, dicentric chromosome, circular chromosome, interchange, translocation, deletion and chromosome lysis. The virus induced very significant sister chromatid exchange rates.

No specific cytopathic effect was found after infection. The virus did not obviously inhibit the cell division and proliferation either. But the infectious virus particles or the virus antigenic substances were found in the infected cells by virus titration, inclusion bodies examination, indirect immunofluorescence technique and electron microscopic examination. It is clear that poliovirus could produce a strong cell genetic effect and lead to non-killing-cell infection in the non-primate cells.

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TRAUMATIC SUBDURAL HYGROMA

[English abstract of article by Zhang Xiang [4545 5046] and Yi Shengyu [2496 5116 4416] of the Department of Neurosurgery, First Affiliated Hospital, The Fourth Military Medical College, Xian]

[Text]

In seven children with traumatic subdural hygroma, most of them showed increased intracranial pressure with focal neurologic deficits. The diagnosis of the disease was made by cerebral angiography, CT scan, ultrasonography, and diagnostic subdural tapping or craniotomy. We conclude that craniotomy or continuous drainage of hygroma should be dependent on the mature of hygroma and age of patients.

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REGENERATION OF FULL-LAYER NECROSED SKULL AFTER HIGH-TENSION ELECTRICAL INJURY

[English abstract of article by Wang Xuewei [3769 1331 1218] of the Department of Burns, Beijing Jishuitan Hospital, Beijing, Gary Miller, Ramon L. Zapata-Sirvent, Brian B. Roberts, and William A. Robinson of the Departments of Surgery, Pathology and Medicine, University of Colorado Health Sciences Center, Denver, Colorado]

[Text]

In 24 patients with electrical burns of the skull, the necrotic skull was treated by a new approach, which includes the use of an adjacent scalp flap to be rotated forward over the necrotic skull. The pathological findings of the full-thickness necrosed skull before and after scalp flap coverage have supported the point that subsequent regeneration of the necrosed skull occurs under the protection of a scalp flap.

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POLLUTION OF COASTAL WATERS TO BE CURBED

HK110348 Beijing CHINA DAILY in English 11 Feb 87 p 1

[Article by staff reporter Guo Zhongshi]

[Text] The State Council has for the first time designated eight sea
areas for dumping wastes in what officials described as "a big step"
toward curbing the growing pollution of China's more than 18,000-kilometers
of coastal waters.

The decision, made a year after China became a member of the London
Dumping Convention, will help protect the marine environment and aquatic
resources, reinforce rational management of sea waters and "clear up the
mess" of past indiscriminate dumping of industrial wastes, said Li Mingfeng,
chief of the management department of the National Bureau of Oceanography.

The London Dumping Convention is an agreement signed by 57 countries aimed
at protecting marine environments.

The eight sea areas designated for dumping include four for emergency
disposal of gasoline by airborne aircraft, a temporary East China Sea
dumping area for human excrement, two for dredged spoils located in the
mouth of the Pearl River and a similar one in Jiaozhou Bay near Shandong
Province.

Wang Fei, an official of the Oceanography Bureau's management department,
told CHINA DAILY that all of the areas were chosen by the bureau after
careful field studies and analysis of their biological resources,
geographic conditions and their aquatic and navigational value.

This year, the bureau will pick more such areas to meet the need of fast-
developing coastal industries, Li Mingfeng said.

However, Wang said, "We are not encouraging people to dump wastes into the
sea and we will be extremely strict with unauthorized waste dumping."

In the past, many enterprises disposed of industrial wastes in the sea
wherever they felt it convenient. The increase in the country's fertilizer
production has caused rampant dumping of large amounts of human excrement

into the sea, causing serious pollution to aquatic resources, he said, adding that the work of protecting the marine environment was left unmanaged for quite some time.

But now, Wang said, the bureau will issue licenses to control the dumping of permissible wastes in addition to strictly prohibiting the dumping of poisonous and radioactive substances, crude oil or refined petroleum products and artificial synthetic materials that are likely to interfere with navigation and fishing.

Meanwhile, the bureau will build up a corps of sea inspectors of considerable strength, he said. So far, such environmental inspectors, equipped with ships and airplanes with infrared monitoring devices, are keeping a close watch on possible violations of the regulation governing waste dumping in the sea, he said.

The bureau has imported some advanced equipment in an attempt to bring its aerial and water monitoring ability to advanced levels by 1990, he said.

Last year, UNESCO's Intergovernmental Oceanographic Commission provided China with the world's most advanced laser disc, capable of collecting and memorizing comprehensive data concerning marine environments and fisheries, he said.

The bureau also has classified wastes to be dumped into different areas and formulated regulations to ensure environmental protection in offshore oil exploration, one of the major sources of marine pollution, he said.

/9604
CSO: 4010/2008

BETTER WASTE COLLECTION URGED

OW090754 Beijing XINHUA in English 0735 GMT 9 Feb 87

[Text] Beijing, 9 Feb (XINHUA)--The PEOPLE'S DAILY today called for greater efforts to boost the waste material collection business--an important channel for promoting production and saving money.

While suffering an acute shortage of aluminum, the country wasted 10,000 tons of this material, simply because there was nowhere for people to sell their used toothpaste tubes.

Also, the purchase price for old newspapers, an ideal raw material for making paper, was reduced time and again, the paper said.

In addition, the collection rate of used plastic materials in China is 15 percent, as against 49 percent in Japan.

Many waste material collection depots have closed down or gone in for more profitable businesses. According to a survey, there is only one waste-collection depot for every 8,700 households in Beijing, whereas the ideal ratio is said to be about 3,000 households to one depot.

The existing stations also refuse to take old batteries, while the country uses up 740 tons of copper, 16,000 tons of zinc and 97,000 tons of manganese powder to produce batteries each year.

Noted Chinese scientist Qian Xuesen proposed the establishment of a special committee at the state level to work out a rational waste collection system.

Despite various difficulties, waste material collection departments retrieved 278 kilograms of gold and 3,800 kilograms of silver in 1986 from electronic components, photographic fixer, and waste film.

/9604
CSO: 4010/2008

RESEARCH IN POLLUTION FROM COAL COMBUSTION DETAILED

[Article: "Environmental Pollution From Coal Combustion and Trends of Research in China"]

[Excerpt] In China, discharge of pollutants into the atmosphere is enormous. It is estimated that combustion products make up 70 percent of atmospheric pollutants and 96 percent of these pollutants comes from the burning of coal. Among harmful substances discharged into the atmosphere, coal is responsible for 87 percent of the total SO_2 and 67 percent of the nitrogen oxide, and its soot accounts for 60 percent of the total particulate discharge. Therefore, typical air pollution in China is from soot.

In recent years, various countries have paid great attention to research on pollution control technology as it is the key to improving the atmospheric environment. The first ting to do for sources of SO_2 pollution, is to reinforce strict controls; coal dressing should be enhanced to lower the sulfur content, and scrubbers and high chimney diffusion should be used during combustion. Today, three desulfurization methods are used: 1) Chemical desulfurization in which the newest method-- microwave desulfurization--can eliminate up to 70 percent of the sulfur and also remove organic sulfur and hot liquid desulfurization which can convert all inorganic sulfur and 20-50 percent of the organic sulfur into sulfite salts that can be eliminated by rinsing; 2) Smoke discharge desulfurization: now, several dozen methods of smoke discharge desulfuriza- tion have been developed. For industrial smoke desulfurization, rinsing with lime or limestone, magnesium oxide, double bases and sodium sulfite are commonly used. For copper oxide absorption, dry absorption, dry-base rinsing, and citrate salts are newly developed industrial techniques. The most valuable industrial techniques to develop are improving SO_2 absorption of present industrial art system using oxalic acid (ethane diacid) as catalyst and dry rinsing method by connecting spray type desiccator to bag type dust extractor or to electrostatic dust remover; and 3) Mechanical desulfurization: 40-90 percent of the sulfur content in coal can be reduced by first being crushed, then eliminating the extraneous matters with clarification process.

Control of pollution from nitrogen oxide must also be enhanced, and production of nitrogen oxide, smoke and gas denitrification have to be restricted. New combustion techniques such as low excess air combustion, non-chemical equivalent weight combustion, lowering burning speed, and smoke and gas recycling can be used to control the sources of pollutants. Denitrification can be achieved through the injection of ammonia or other reducing gases and by reducing nitrogen oxide to nitrogen gas. Recently, we have also made definite progress in research and application of desiccation, catalysis, and dry and wet absorption methods.

Controls on sources of soot pollution, the widely used washing, filtration, bags and electrical dust precipitators are highly efficient dust extracting facilities. Recently, highly efficient, low-cost cellulose filters have been studied as a replacement for electrostatic scrubbers.

In general, studies on controlling air pollution, on main sources of SO_2, nitrogen oxide, and soot have been developed from individual event control to comprehensive prevention, and a preliminary preventive engineering system has also been made. With regard to coal burning, prevention should be stressed over control in environmental pollution. We should strengthen methods of control and survey, conduct effective multi-factor adjustments, and use systematic analysis and systematic engineering methods to find the best way to solve problems.

/9604
CSO: 4008/2070

ULTRAVIOLET SOLAR RADIATION IN CHINA STUDIED

[Article by Zhou Yunhua [0179 0336 5478]: "Ultraviolet Solar Radiation in China"]

[Text] I. Introduction

Due to its strong biological and chemical effect, ultraviolet solar radiation has received great attention in many areas including agronomy, biology, medical and health care, environmental protection, meteorology, photography, dye transfer industry, as well as the design of standard light source. There has been a great deal of measurements on the spectral distribution of ultraviolet radiation, whose results are mainly given in terms of relative energy.[1-6]

For a number of years, artificial fiber and plastic goods have been mass produced along with the development of the chemical industry, ultraviolet radiation can speed up the aging process of these high molecular polymers and cause fading of pigments and dyes. In environmental protection, ultraviolet radiation is an important factor in bringing about toxic photochemical vapor. In medicine, it has been found that ultraviolet radiation may be an important factor in the cause of skin cancer. For these reasons, people can no longer be satisfied with understanding the relative spectral distribution of ultraviolet radiation but have made urgent demand to understand the absolute value of ultraviolet radiation energy as well as the law governing its variation with latitudes, elevation, and meteorological conditions.

There has been little development in the work to systematically measure the absolute value of ultraviolet radiation energy[7-9] and we still rely on indirect calculations to understand the law of its geographical distribution. V.A. Belinsky and L.M. Andrienko[10] had proposed a simplified atmospheric model to calculate ultraviolet radiation. Based on spectral measurement data of direct radiation, the author[11] has recently obtained an empirical formula and nomograms for calculating ultraviolet (less than 0.4 micron in wavelength) direct radiation, and has further advanced meteorological formulas for calculating ultraviolet diffused radiation and ultraviolet global radiation under different weather conditions. These formulas enable us to concretely figure out the time and spatial law of distribution of ultraviolet solar radiation energy in China.

II. Energy Flux of Ultraviolet Direct Radiation in Eight Regions in China

1. Calculation of ultraviolet direct radiation

Having analyzed 2,698 sets of direct radiation spectral measurement data at 10 test sites in 8 regions in China,[11] the author pointed out that by knowing only the solar direct radiation flux S of whole wavelength range on a plane normal to light rays at the earth's surface as well as the adjusted surface vapor pressure E^* ($= \frac{P_0}{P} E$, where P_0 is the standard atmospheric pressure, P is the vapor pressure of the test site, and E is the surface vapor pressure), then we may empirically determine the ultraviolet direct radiation flux S_Δ on a plane normal to light rays at the earth's surface. Reference 11 has also given the empirical formula and nomogram for calculating S_Δ. The article suggested that when $S \leqslant 1.30$ cal/cm$^2 \cdot$m,[1] S_Δ satisfies the empirical relation:

$$\log S_\Delta = a + b \lg s \tag{1}$$

in which

$$a = 0.235 \log E^* - 1.839, \quad b = 3.452 - 0.0102 E^* \tag{2}$$

The unit for S_Δ and S is cal/cm$^2 \cdot$m^1, while the unit for E^* is mb.

When $S > 1.30$ cal/cm$^2 \cdot$m, S_Δ changes slowly along with S. The above empirical formula and nomogram given in reference 11 were entirely obtained empirically from observation data. It is necessary for us to inquire further into their physical implications before using them for meteorological calculations.

Solar radiation is weakened by three things when passing through the atmosphere: 1) diffusion by air molecules; 2) solid or liquid particles suspended in the air, in other words, diffusion and absorption by aerosol; and 3) selective absorption by certain gases. For wavelengths with a range less than 0.3 μm, because of strong absorption by O_2, N_2, O, N, and O_3, this portion of energy cannot reach the earth's surface, and in the 0.3-0.4 micron ultraviolet range, ultraviolet direct radiation energy flux S_Δ may be written as:

$$S_\Delta = \int_{0.3}^{0.4} I_{0\lambda} e^{-(\tau_{1\lambda} m + \tau_{2\lambda} m_h + \tau_{3\lambda} m_h)} \, d\lambda \tag{3}$$

In the equation, $I_{0\lambda}$ is the solar spectral irradiance outside the atmosphere and $\tau_{1\lambda}$ is the optical thickness of air molecules at sea level, which is the known function of the wavelength λ. $\tau_{2\lambda}$ and $\tau_{3\lambda}$ are the respective optical thickness of the O_3 and aerosol particles in the sky above the test site. m and m_h are the absolute air mass and relative air mass, respectively. Their correlation is $m_h = \frac{P_0}{P} m$. The optical depth $\tau_{2\lambda}$ of O_3 may be written as $\tau_{2\lambda} = k_\lambda 1$, in which k_λ is the absorption coefficient of O_3 and 1 is the thickness of O_3. Whereas, the optical thickness $\tau_{3\lambda}$ of aerosol according to Angstrom's study[12] may be written as $\tau_{3\lambda} = \frac{\beta}{\lambda \alpha}$, in which β and α are,

respectively, Angstrom's atmospheric turbidity coefficient and wavelength exponent. They are determined by the content and volume distribution of aerosol and are not related to wavelengths. If we substitute these correlations in Equation (3), we have:

$$S_\Delta = \int_{0.3}^{0.4} I_{0\lambda} e^{-[\tau_{1\lambda}+k_\lambda 1^* + \frac{\beta^*}{\lambda^\alpha}]m} \, d\lambda = S_\Delta(1^*, \beta^*, \alpha, m) \tag{4}$$

in which

$$1^* = \frac{P_0}{P} 1, \quad \beta^* = \frac{P_0}{P} \beta$$

Equation (4) clearly shows that ultraviolet direct radiation S_Δ is the function of the four factors 1^*, β^*, α, and m. Because we lack observation data on the O_3 content and characteristics of aerosol, we are unable to calculate S_Δ directly.

Considering that we have very conveniently obtained whole range integrated solar direct radiation energy flux S, and that S itself is also affected by O_3 content and aerosol, in other words, the value of S already includes the information on O_3 and aerosol. The problem is now whether we are able to directly use S to calculate S_Δ. It is worth pointing out that: for S, we must also consider the selective absorption of infrared range by water vapor. The optical thickness of vapor $\tau_{4\lambda}$ can be written as $\tau_{4\lambda} = k'_\lambda W$, in which k'_λ is the absorption coefficient of vapor mass and W is the precipitable vapor of the atmosphere. A recent study by the author[13] shows that in China, there is an empirical relationship between W (in cm) and surface vapor pressure E (in mb):

$$\log W = -0.951 + 1.118 \log E \tag{5}$$

Actually, the relationship between W and E described above may be roughly expressed in linear terms:

$$W = 0.18E \tag{6}$$

When E is less than 30 mb, the maximum difference in the computation results of Equations (6) and (5) does not exceed 0.3 cm. In this way, the optical thickness of vapor may be written as $\tau_{4\lambda} = 0.18k'_\lambda E$. The whole range integrated solar direct radiation energy flux S may be written as:

$$S = \int_{0.3}^{\infty} I_{0\lambda} e^{-(\tau_{1\lambda}+k_\lambda 1^* + \frac{\beta^*}{\lambda^\alpha} + 0.18k'_\lambda E^*)m} \, d\lambda = S(1^*, \beta^*, \alpha, E^*, m) \tag{7}$$

In which

$$E^* = \frac{P_0}{P} E$$

Equation (7) clearly shows that the energy flux of integrated direct radiation S is the function of 1^*, β^*, α, E^*, and m. Compared to Equation (2), it has one factor E^* more than the energy flux of ultraviolet direct radiation S_Δ. In this way it will be possible to establish certain empirical correlations between S and S_Δ:

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$$S = S(S_\Delta, E^*)$$

or,

$$S_\Delta = S_\Delta (S, E^*) \tag{8}$$

Evidently, the author's suggestion[11] to use the two physical quantities E^* and S to determine the empirical formulas (Equation (1)) and nomograms based on large quantities of measurement data has its physical foundation. This article will use this formula and nomogram to calculate ultraviolet direct radiation.

2. Geographical differences and seasonal variation of ultraviolet direct radiation

Eight typical regional stations were selected (in Beijing, Shanghai, Guangzhou, Hanbin, Wuhan, Chengdu, Hetian, and Lhasa), fixed-time solar radiation observation data for the 4 seasonal months of January, April, July, and October for 5 consecutive years during 1976–1980 were tabulated, the fixed-time monthly mean ultraviolet direct radiation energy flux on the horizontal plane were calculated, and the monthly mean daily total S_Δ' was then calculated by the trapezium method, as listed on the left side of Table 1. During the calculations, the corresponding value of the 15th of the month in concern was used as the mean solar elevation and sunrise-sunset times of the fixed-time monthly observation time. The right portion of Table 1 lists the ratio η_s of S_Δ' in integrated direct radiation.

Table 1. Monthly Mean Daily Total Ultraviolet Direct Radiation S_Δ' on the Horizontal Plane and Its Ratio η_s in the Integrated Direct Radiation

Location	S_Δ' (J/cm^2·d)				η_s (percent)			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Harbin	4.2	18.8	29.3	13.4	1.1	2.0	2.6	2.0
Beijing	9.2	28.5	32.2	27.6	1.9	2.9	3.6	3.4
Shanghai	7.9	15.1	30.5	19.2	1.8	2.0	3.2	2.6
Wuhan	5.9	15.1	43.5	18.8	1.7	2.3	3.9	2.7
Chengdu	0.8	8.4	20.9	14.2	0.4	1.5	2.6	3.7
Guangzhou	8.8	7.5	29.7	20.1	2.0	2.1	3.1	2.3
Hetian	11.7	18.0	26.4	22.2	2.5	2.6	2.5	2.5
Lhasa	56.5	72.4	85.4	76.1	4.5	4.8	5.3	5.1

Several basic characteristics of ultraviolet direction radiation are evident in Table 1: 1) the totals are very small and their ratios in the integrated direct radiation are less than 5 percent; 2) the figures for the plateau region are clearly higher than those of the plain regions, the energy flux of Lhasa is about four times higher than those of the plains regions and the values of η_s are about twice as high as those in the plains; 3) in terms of the seasons, it is highest in the summer, next highest in the fall and lowest in the winter; 4) there is no systematic variation with latitudes, but

regional differences are evident as the figure is low for Chengdu during the winter. The Sichuan Basin in January is the region in China where solar radiation is most severely reduced by aerosol in the same period.[14] This does not merely reduce direct radiation but also drastically lowers the ultraviolet composition in direct radiation because of wavelength selectivity of aerosol diffusion.

Xiang Yueqin [7309 2588 3830] and others[15] have made a preliminary analysis of certain characteristics of ultraviolet direct radiation on the basis of results of spectral radiation measurements throughout China. Computation results in this article tally with their observed facts.

III. Ultraviolet Diffused Radiation and Ultraviolet Global Radiation Energy Flux in Clear Sky

1. Ultraviolet diffused radiation in clear sky

Reference 11 suggests that the following equation can be used to calculate ultraviolet diffused radiation flux $D_{0\Lambda}$ received on the horizontal plane in clear sky:

$$D_{0\Lambda} = 0.5 \ [(\frac{R_0}{R})^2 \varphi_\Lambda - S_{0\Lambda}] \ \sin h \qquad (9)$$

in which

$$\varphi_\Lambda = \int_{0.3}^{0.4} I_{0\lambda} e^{-k_\lambda 1 m_h} d\lambda \qquad (10)$$

In the equation, R_0 and R are the sun-earth mean distance and sun-earth distance, respectively, $S_{0\Lambda}$ is the ultraviolet direct radiation energy flux on a plane normal to the solar beam at the earth's surface in clear sky, h is the solar elevation, and 1 is the absorption coefficient of O_3. Reference 11 has given the correlation curve of φ_Λ and $1m_h$, in which the solar spectral irradiance outside the atmosphere is taken from the most recently recommended data[16] of the world meteorological organization, the solar constant is 136.7 W x 10^{-3}/ cm^2 using Equation (9) to calculate the mean value of fixed-time ultraviolet diffused radiation energy flux in clear sky during the 4 seasonal months in the eight regions of Beijing, Shanghai, and others, and the daily totals are calculated by the trapezium method and are listed on the left side of Table 2. In the calculations, the thickness of O_3 was taken from the data,[17] and different values of thickness of O_3 were used for different stations in different months. The right side of Table 2 lists the ratios η_{D_0} of ultraviolet diffused radiation in integrated diffused radiation in clear sky.

Several basic characteristics of ultraviolet diffused radiation in clear sky are evident in Table 2: 1) In the plain regions, ultraviolet diffused radiation is much higher in value than ultraviolet direct radiation. Its ratio in integrated diffused radiation is also high, with η_{D_0} of seven stations being (13.1 ± 2.4) percent. 2) The value of $D_{0\Lambda}$ in the plateau region is clearly lower than those of the plain regions, which is (40.6 ± 10.5) $J/cm^2 \cdot d$ in Lhasa for the 4 seasonal months, just about half of that in the plain regions which

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Table 2. Mean Daily Total Ultraviolet Diffused Radiation $D_{0\Lambda}$ and Its Ratio ηD_0 in the Integrated Diffused Radiation in Clear Sky

Location	$D_{0\Lambda}$ ($J/cm^2 \cdot d$)				ηD_0 (percent)			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Harbin	28.9	78.7	92.0	51.0	11.4	13.9	16.6	15.0
Beijing	39.7	83.7	94.1	56.1	11.9	10.9	11.6	12.8
Shanghai	51.9	94.6	87.4	64.4	12.9	11.8	17.4	15.3
Wuhan	54.4	92.0	79.9	67.4	12.6	11.7	15.3	15.5
Chengdu	59.0	99.2	94.1	74.1	9.8	10.6	11.0	13.8
Guangzhou	64.4	92.0	85.4	76.1	15.9	14.6	15.1	16.6
Hetian	40.6	99.6	105.9	64.4	11.6	8.4	10.0	11.4
Lhasa	28.9	53.6	43.1	36.8	17.4	15.4	17.9	20.7

is 74.1 ± 41.4 $J/cm^2 \cdot d$. This is because the air in the plateau is thin, with the result that the molecules and aerosol diffusion is much weaker than the plain regions. But its ratio in the integrated diffused radiation is noticeably higher compared to the plain regions, reaching (17.9 ± 2.2) percent. This is caused by the low aerosol content in the air in plateaus. According to the results of measurements by Xiang Yueqin and others,[15] the atmospheric turbidity coefficient β of Lhasa in October is merely 0.024, while that of Suzhou which is situated at the same latitude is as high as 0.115 in the same period. An increase in aerosol content can cause a corresponding increase in the ratio of long wavelengths in diffused radiation. This is the cause of higher ultraviolet composition in diffused radiation in plateau regions than plain regions. 3) In terms of seasonal changes, $D_{0\Lambda}$ is higher in the summer than the winter and higher in the spring than the fall. The study by Wang Bingzhong [3076 3521 1813][14] has shown that in most regions of China, spring is the season with the poorest atmospheric transparency while the best season is the late fall and early winter. Results of atmospheric turbidity measurements by Zhou Yunhua and others[18,19] in Beijing and the Hulun Buir Grasslands are consistent with the inferences discussed above. The atmosphere is turbid in the spring and clear in the fall, with the result that the value of $D_{0\Lambda}$ is higher in the spring than the fall while the value of ηD_0 is higher in the fall than the spring. 4) It is not too evident that ultraviolet diffused radiation varies with latitudes. Generally speaking, it is slightly higher at low latitudes than high latitudes, but regional differences are prominent. The value of ηD_0 in Chengdu during January and that in Hetian during April are clearly on the low side (less than 10 percent in both cases) precisely because the atmosphere is particularly turbid at these two places in those seasons.

2. Ultraviolet global radiation in clear sky

Ultraviolet global radiation in clear sky $Q_{0\Lambda}$ is the sum of ultraviolet direct radiation and ultraviolet diffused radiation at sea level:

$$Q_{0\Lambda} = S_{0\Lambda} \sin h + D_{0\Lambda} \tag{11}$$

In this equation, $S_{0\triangle}$ is the ultraviolet direct radiation energy flux on a plane normal to the solar beam at the earth's surface in clear sky and is calculated according to the nomograms in Reference 11. After calculating the fixed-time value of $Q_{0\triangle}$ in the eight regions of Beijing, Shanghai, and others, the trapezium method was used to obtain the mean daily totals which are listed on the left side of Table 3. The right side of the table lists their ratios η_{Q0} in the integrated global radiation.

Table 3. Mean Daily Total Ultraviolet Global Radiation $Q_{0\triangle}$ and Its Ratio η_{Q0} in the Integrated Global Radiation in Clear Sky

Location	$Q_{0\triangle}$ (J/cm$^2 \cdot$ d)				η_{Q0} (percent)			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Harbin	33.5	108.4	141.1	69.1	4.9	5.1	5.4	5.4
Beijing	47.7	116.4	139.0	78.7	5.0	5.0	5.5	5.3
Shanghai	65.7	118.9	145.3	95.9	5.4	5.2	6.0	5.8
Wuhan	66.2	122.3	154.1	95.0	5.6	5.4	5.9	5.9
Chengdu	59.9	115.1	139.4	90.0	6.1	5.2	5.5	5.7
Guangzhou	85.4	128.1	142.4	107.2	5.9	5.8	5.9	6.1
Hetian	54.0	105.1	126.4	79.6	4.9	5.0	5.1	5.2
Lhasa	95.9	162.5	189.4	129.0	5.7	5.8	6.2	6.3

Several basic characteristics of ultraviolet global radiation in clear sky are evident in Table 3: 1) The flux value of ultraviolet global radiation has noticeable seasonal variation, which is highest in the summer, next highest in the spring and lowest in the winter. 2) Generally speaking, the flux value decreases slightly as the latitude increases, which is even more evident in the winter. 3) The flux value in the plateau region is clearly higher than those in the plain regions. In the summer it is about 30 percent higher in Lhasa than Shanghai and Wuhan which are at the same latitude, and in the winter it is 50 percent higher. 4) Although the flux value has noticeable seasonal variation and geographical differences, its ratio in the integrated global radiation is quite stable and varies little with seasons and regions. The 4 seasonal months at the eight stations is (5.5 ± 0.4) percent). The plateau city of Lhasa is particularly interesting, for even though its ultraviolet global radiation flux is evidently higher than those in the plain regions, η_{Q0} approximates that of Wuhan and Shanghai which are at the same latitude.

IV. Ultraviolet Diffused Radiation and Ultraviolet Global Radiation Under Cloudy Weather

1. Ultraviolet diffused radiation under cloudy weather

Fixed-time ultraviolet diffused radiation flux $D_{\triangle}$ at sea level under cloudy weather can be calculated by the equation below[11]:

$$D_{\triangle} = \eta_{D0} (1 - n) D_0 + 1.1\eta_{Q0}[D - (1 - n)D_0] \tag{12}$$

In the equation, n is the fixed-time monthly mean total cloudcover (in decimal), D_0 is the fixed-time mean value of flux of integrated diffused radiation flux under cloudy weather, η_{D0} and η_{Q0} are the ratios of ultraviolet diffused radiation and ultraviolet global radiation corresponding to its integrated radiation under clear sky.

We have calculated the fixed-time values of 4 seasonal months at the eight stations according to Equation (12) and worked out their monthly mean daily totals by the trapezium method, which are listed on the left side of Table 4. The right side of the table lists their ratios η_D in the integrated diffused radiation.

Several basic characteristics of ultraviolet diffused radiation under cloudy weather are evident in Table 4: 1) The presence of clouds reduces the value of ultraviolet diffused radiation flux in the plain regions. The mean of the seven stations in plain regions reduced from 74.1 ± 20.5 J/cm^2·d in clear sky to 51.9 ± 15.5 J/cm^2·d under cloudy weather, but the effect of clouds on the value of ultraviolet diffused radiation flux in the plateau regions is not clear. This shows that in the plain regions the diffusion of ultraviolet radiation by relatively thick atmosphere is stronger than the diffusion by clouds, but in the plateau regions where the atmosphere is relatively thin, there is little difference between its diffusion of ultraviolet radiation and diffusion by cloud clusters. 2) The presence of clouds greatly reduces the ratio of ultraviolet radiation in diffused radiation. At the seven stations in the plain regions in clear sky, $\eta_{D0} = (13.1 \pm 2.4)$ percent, but under cloudy weather this is reduced to $\eta_D = (8.5 \pm 1.1)$ percent. The reduction is even greater in the plateau region, in Lhasa this is reduced from $\eta_D = (17.9 \pm 2.2)$ percent to $\eta_D = (9.0 \pm 1.6)$ percent. The reason is that cloud drops are large particle diffusion unrelated to wavelengths. The presence of clouds increases the composition of diffused radiation with relatively long wavelengths and reduces the composition of ultraviolet radiation. As for the plateau regions, owing to the composition of aerosol in the air, the ultraviolet composition in diffused radiation in clear sky is even higher, so that the reduction of ultraviolet proportion caused by clouds becomes even more evident. 3) The presence of clouds greatly reduces the seasonal variation and geographical differences of D_Δ and η_D.

2. Ultraviolet global radiation under cloudy weather

By adding the monthly mean daily total ultraviolet direct radiation S_Δ' on the horizontal plane listed on the left side of Table 1 to the monthly mean daily total ultraviolet diffused radiation D_Δ listed on the right side of Table 4, we obtain the monthly mean daily total ultraviolet global radiation under cloudy weather Q_Δ listed on the left side of Table 5. The mid-section of Table 5 lists their ratios η_Q in integrated global radiation. In order to understand the amounts of direct radiation and diffused radiation contributed to D_Δ ultraviolet global radiation, the right side of the table lists the ratios D_Δ/Q_Δ of ultraviolet diffused radiation D_Δ in ultraviolet global radiation Q_Δ.

Table 4. Monthly Mean Daily Total Ultraviolet Diffused Radiation D_Λ and Its Ratio η_D in the Integrated Diffused Radiation Under Cloudy Weather

Location	D_Λ (J/cm²·d)				η_D (percent)			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Harbin	25.5	59.4	71.5	41.0	9.3	8.0	8.4	10.6
Beijing	33.5	66.5	70.7	48.1	9.2	7.8	7.5	10.3
Shanghai	33.9	55.2	61.1	49.4	9.4	7.7	8.4	9.6
Wuhan	30.1	51.0	59.8	51.5	8.6	7.7	8.8	10.5
Chengdu	30.1	54.8	65.7	41.0	7.8	7.0	7.0	7.7
Guangzhou	42.3	43.5	59.0	60.7	9.5	7.1	7.9	10.1
Hetian	30.5	74.9	85.8	54.4	7.0	7.3	8.1	9.8
Lhasa	28.5	49.4	53.1	37.2	10.6	7.6	7.7	10.1

Table 5. Monthly Mean Daily Total Ultraviolet Global Radiation Q_Λ and Its Ratio η_Q in the Integrated Global Radiation as Well as the Ratio D_Λ of the Ultraviolet Diffused Radiation Q_Λ in the Ultraviolet Global Radiation D_Λ/Q_Λ

Location	Q_Λ (J/cm²·d)				η_Q (percent)				D_Λ/Q_Λ (percent)			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Harbin	29.7	78.2	100.8	54.4	4.7	4.7	5.0	5.2	86	76	71	75
Beijing	42.7	95.0	102.9	75.7	5.0	5.2	5.6	5.9	78	70	69	64
Shanghai	41.8	70.3	91.6	68.6	5.3	4.8	5.4	5.5	81	79	67	72
Wuhan	36.0	66.1	103.3	70.3	5.2	5.0	5.7	5.9	84	77	58	73
Chengdu	31.0	63.2	86.6	55.2	5.4	4.7	5.0	6.0	97	87	76	74
Guangzhou	51.0	51.0	88.7	80.8	5.7	5.3	5.2	5.5	83	85	67	75
Hetian	42.3	92.9	112.1	76.6	4.6	5.4	5.3	5.3	72	81	76	71
Lhasa	84.9	121.8	138.5	113.4	5.6	5.6	6.0	6.0	33	41	38	33

The ultraviolet radiation flux under cloudy weather has noticeable seasonal variation and regional differences. It is higher in the summer than the winter and higher in the plateau than plain regions. In the plain regions, diffused radiation is responsible for at least 70 percent of the ultraviolet global radiation, while in Lhasa this ratio is reduced to under 40 percent. This clearly shows that as elevation increases, the predominance of ultra-violet diffused radiation in ultraviolet global radiation gradually gives way to ultraviolet direct radiation.

It is most noteworthy that the ratio of ultraviolet global radiation in inte-grated global radiation is quite stable. Its seasonal and geographical differences are small. For the eight stations in the 4 seasonal months, $\eta_Q = (5.3 \pm 0.4)$ percent. This value is very close to that of η_{Q0} in clear sky, which is (5.5 ± 0.4) percent.

The author[11] has analyzed the results of measurements in Great Britain, the United States, Canada, India, and South Africa under different kinds of weather and has shown that the ratio of ultraviolet global radiation in integrated global radiation is 4.6 to 5.9 percent with a mean of 5.4 percent. At the same time, results of computation of the eight regions in China have shown that when the solar elevation is greater than 10°, the ratio is (5.4 ± 0.7) percent. The figures discussed above are very consistent with the value of (5.3 ± 0.4) percent obtained by this article. This characteristic has provided an extremely convenient condition for meteorological estimation of ultraviolet global radiation. Regardless of geographical locations and elevation of the station, and regardless of the season and weather conditions, we may use the following formula to estimate the approximate ultraviolet global radiation energy flux Q_Δ:

$$Q_\Delta = 0.053\ Q \tag{13}$$

in which Q is the corresponding integrated global radiation energy flux.

V. Time and Spatial Distribution of Ultraviolet Global Radiation in China

Using the global radiation data in the recently published ZHONGHUA RENMIN GONGHEGUO QIHOU TUJI [Climatic Charts of the People's Republic of China,[20,21] we have adopted Equation (13) to compute and draw the annual ultraviolet global radiation distribution charts for the four seasons of spring (March–May), summer (June–August), fall (September–November), and winter (December–February) in China.

People are most interested in ultraviolet radiation in plateau regions, but the station data used in the original charts ended in 1970.[20,21] Test points are sparse in the central-western part of the Qinghai-Xizang Plateau, and there is almost no available data particularly west of 85°E. For this reason, this article has added eight stations (data up to 1980, observation periods all exceed 7 years), of which the global radiation for the three stations at Amdo, Xainza anad Nyalam in the central part of the plateau was calculated by the equation similar to that in the References 20 and 21:

$$Q = Q_1\ [0.18 + (0.55 + 1.11\ \frac{1}{E})\ S_1] \tag{14}$$

In the equation, Q_1 is the ideal energy flux of atmospheric global radiation, E is the annual mean surface vapor pressure (in mb) and S_1 is the percentage of sunshine.

In the western part of the plateau, we first analyzed the observation data (July 1971 to September 1979) of the solar radiation station at Gar which was newly built in 1971, and found that the global radiation there varies too much with the law expressed in Equation (14). The regression equations they satisfy are:

$$Q = Q_1\ (0.015 + 0.913\ S_1)\ \text{(May–September)} \tag{15}$$

$$Q = Q_1\ (0.305 + 0.630\ S_1)\ \text{(October–April)} \tag{16}$$

The correlation coefficients of Equations (15) and (16) are 0.85 and 0.82, respectively, (Figure 1). On this basis, Equations (15) and (16) were adopted to calculate the value of Q for the five newly added stations (in Gar, Gerze, Pulan, Taxkorgan, Kangxiwar) west of 85°E in the Qinghai-Xizang Plateau.

Although eight stations have been added, they are still too few for the vast Qinghai-Xizang Plateau, and for this reason consideration has been given to remote sensing information of man-made satellites.

Zhou Yunhua and others[22] used cloud charts and photographs of Satellite TIROS-N to tabulate the cloudcover distribution of the Qinghai-Xizang Plateau in the summer of 1979 and pointed out that in the central-western part of the plateau, the longwave radiation field and cloudcover field of the earth-atmospheric system are very similar, which shows that the radiation field of this stretch of area is largely affected by the cloudcover field. We know that cloudcover is precisely the most important factor that affects the surface global radiation. Based on the cloudcover field obtained from the satellite cloud charts, Xiang Yueqin[23] has successfully calculated the global radiation field in the Qinghai-Xizang Plateau in the summer of 1979.

From the mean topographic charts of the longwave radiation field of the four seasons obtained from the results of measurement of 45 months of Satellite NOAA (June 1974-February 1978), it is evident that[24]: the northern part of the Qinghai-Xizang Plateau in the winter and spring are precisely the low center of the radiation field while the radiation in the summer increases progressively from the southeast to the northwest, though the radiation field of the entire plateau in the fall is relatively even. From this, it is possible to figure out that in the winter and spring, cloudcover is light in the south and heavy in the north of the plateau. This is consistent with the conclusion argued in the literature[22,23] that there is a high cloudcover belt along the plateau's principal axis (near 35°N) in May and a low global radiation area of the plateau. In the summer, due to the effect of the southwesterly monsoon, the plateau cloudcover decreases progressively from the southeast to the northwest while in the fall the cloudcover distribution is relatively even.

Figures 2 and 3 are, respectively, distribution charts of the annual total and four-season mean daily total ultraviolet global radiation in China. In drawing these charts, the trends of the isograms of the central-western part of the Qinghai-Xizang Plateau were drawn precisely by taking into account the characteristics of cloudcover distribution discussed above.
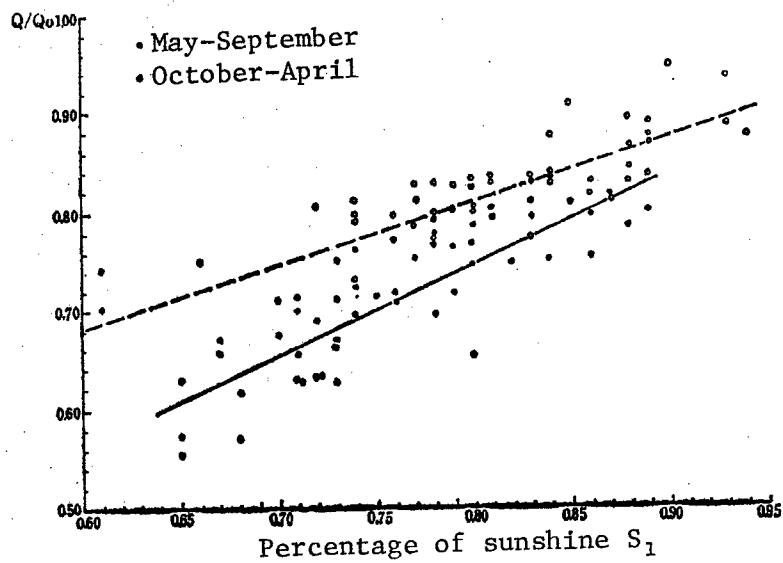
Figure 1. Relation Between the Values Q/Q_1 and Percentage of Sunshine S_1 in GAR.
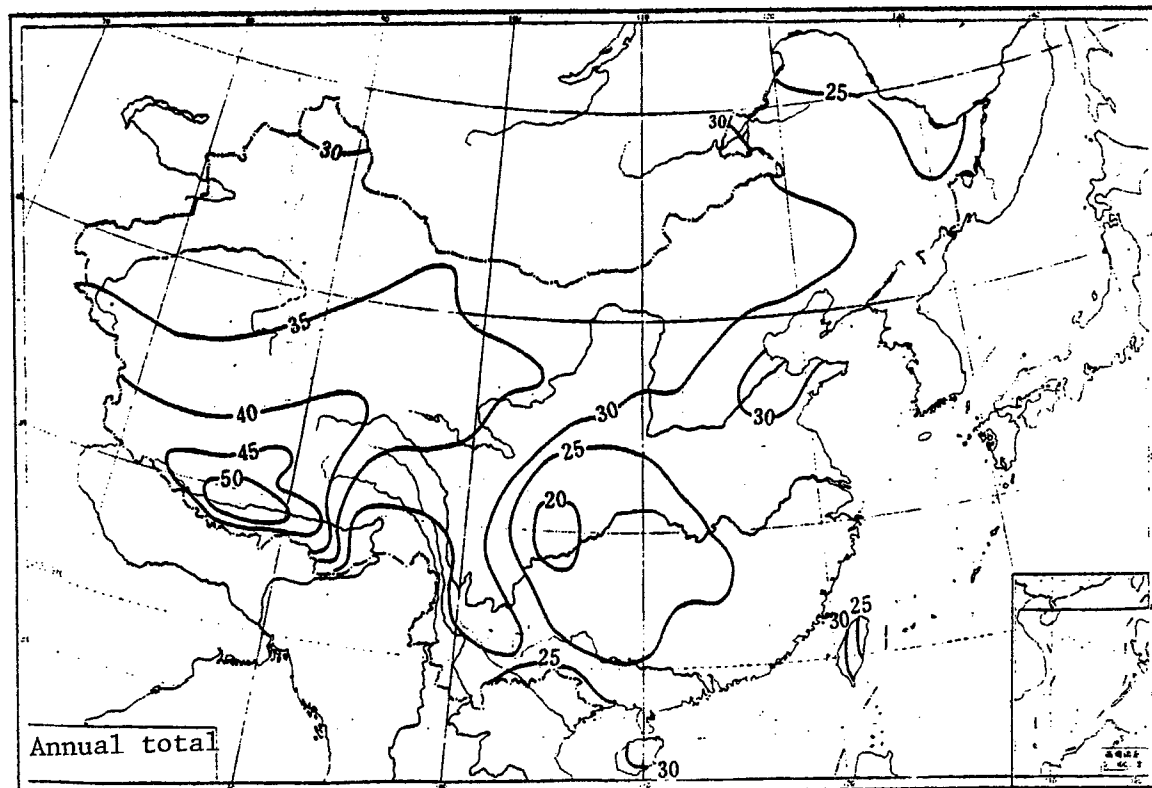

Figure 2. Geographical Distribution of the Yearly Sums of the Ultraviolet Global Radiation in China (Unit: $J \times 10^3/cm^2 \cdot a$)
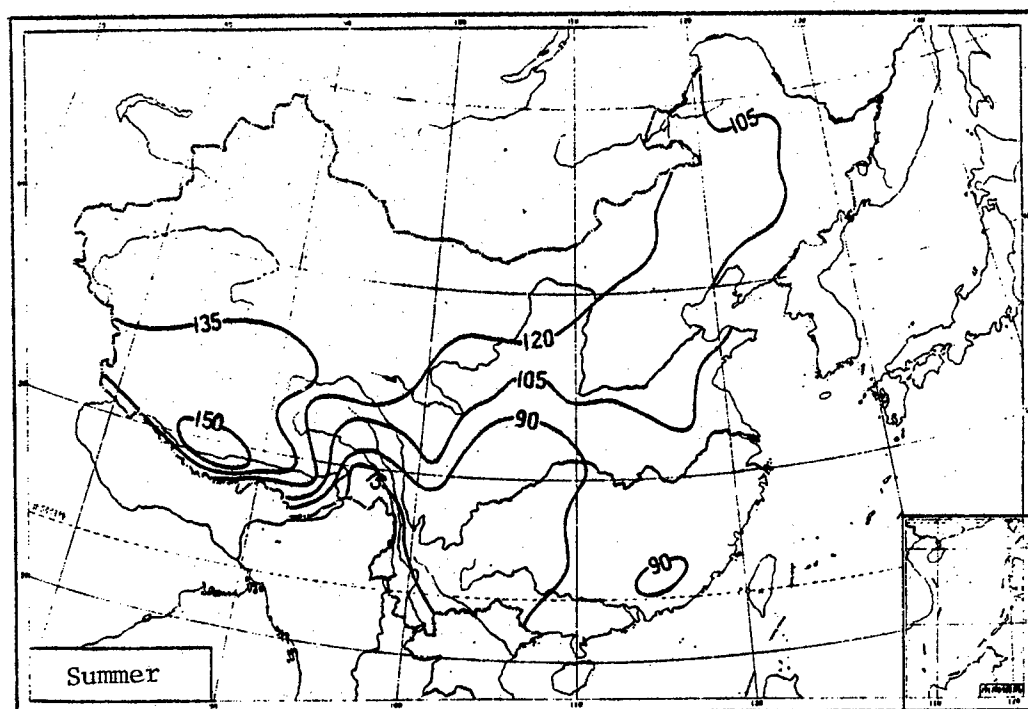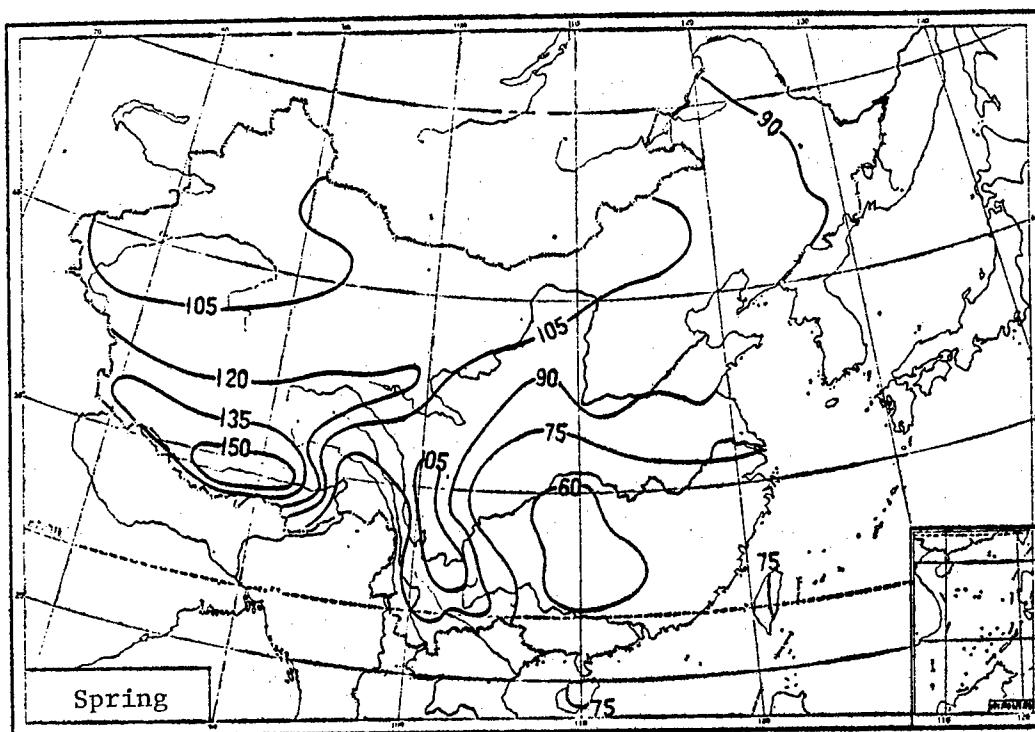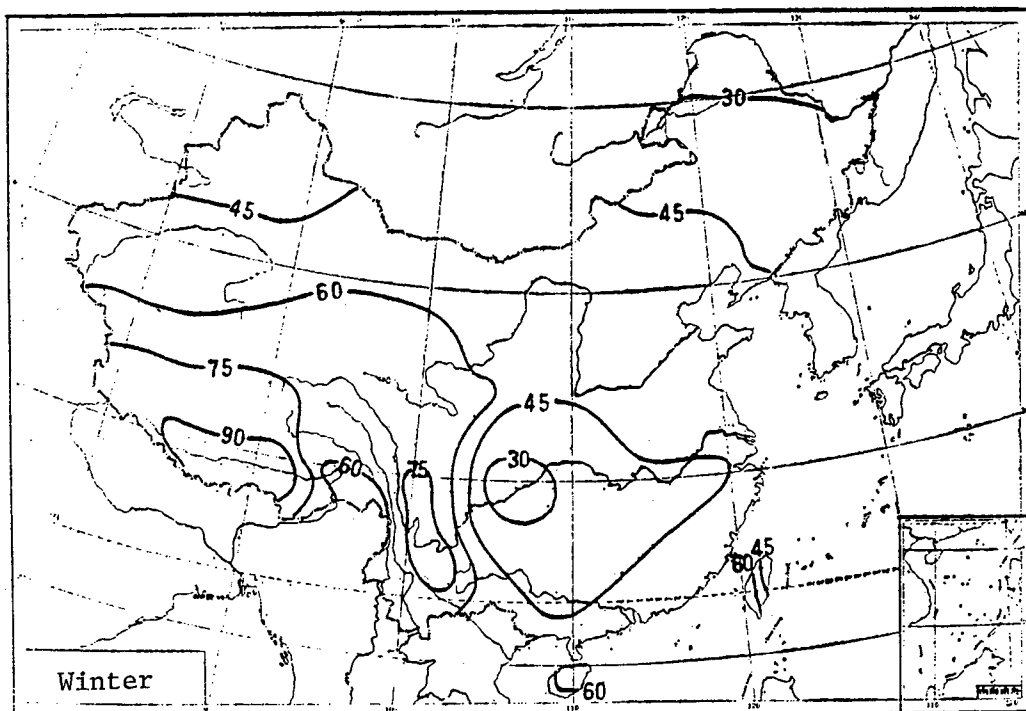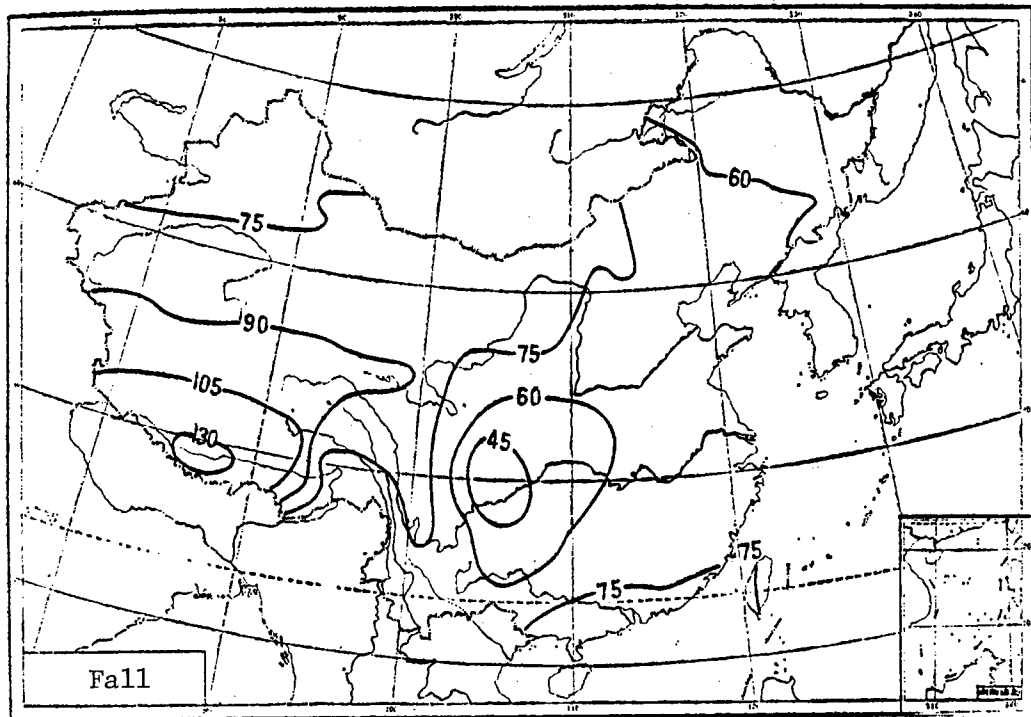
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Figure 3. Geographical Distributions of Mean Daily Sums of Ultraviolet
Global Radiation Four Seasons in China   (Unit: $J/cm^2 \cdot d$)

  (a) Spring (March-May)   (b) Summer (June-August)

Fall

Winter

[Continuation of Figure 3]

    (c) Autumn (September–November) (c) Winter (December–February)

FOOTNOTES

1. Equation (1) is cited from Reference 11. Both S and S_Λ are converted to cal/cm^2·min according to legal unit of measurement, 1 cal/cm^2·min = 69.8W x 10^{-3}/cm^2.

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BRIEFS

ECOLOGY ATLAS--Changchun, 7 Feb (XINHUA)--China's first ecology atlas will be published this June, an official of the Changchun Geographic Research Institute announced today. With 98 maps of and 150 photographs, it records potential natural disasters in China, the distribution of animals and plants near extinction, problems caused by excess exploitation of natural resources and efforts to restore the country's ecological balance in the past three decades. The institute was commissioned by the Ministry of Urban and Rural Construction and Environmental Protection to compile the atlas. [Text] [Beijing XINHUA in English 1133 GMT 7 Feb 87] /9604

CLIMATE COMMISSION--Beijing, 27 Jan (XINHUA)--China will set up a State Climate Commission, according to the State Meteorological Administration. The new organization will do research on weather forecasting, climatology and related areas, and will work directly with foreign countries and adjust the work of related departments to better serve China's economic construction. [Text] [Beijing XINHUA in English 1238 GMT 27 Jan 87] /9604

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